Technical Report 886

Methodology for Defining and Sampling from the Domain of Threat Conditions for Crew and Platoon Tactical Gunnery

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Human Resources Research Organization

March 1990

United States Army Research Institute for the Behavioral and Social Sciences

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency Under the Jurisdiction of the Deputy Chief of Staff for Personnel

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS --
2a. SECURITY CLASSIFICATION AUTHORITY --	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE --	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) FR-PRD-90-02	5. MONITORING ORGANIZATION REPORT NUMBER(S) ARI Technical Report 886
6a. NAME OF PERFORMING ORGANIZATION Human Resources Research Organization 6b. OFFICE SYMBOL (If applicable) --	7a. NAME OF MONITORING ORGANIZATION U.S. Army Research Institute for the Behavioral and Social Sciences
6c. ADDRESS (City, State, and ZIP Code) 1100 S. Washington Street Alexandria, VA 22314	7b. ADDRESS (City, State, and ZIP Code) ARI Field Unit-Fort Knox ATTN: PERI-IK Fort Knox, KY 40121-5620
8a. NAME OF FUNDING/SPONSORING ORGANIZATION U.S. Army Research Institute for the Behavioral and Social Sciences 8b. OFFICE SYMBOL (If applicable) PERI-I	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER DAHC35-89-C-0009
8c. ADDRESS (City, State, and ZIP Code) 5001 Eisenhower Avenue Alexandria, VA 22333-5600	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO.: 62735A; PROJECT NO.: 790; TASK NO.: 3205; WORK UNIT ACCESSION NO.: C1

11. TITLE (Include Security Classification)
Methodology for Defining and Sampling from the Domain of Threat Conditions for Crew and Platoon Tactical Gunnery

12. PERSONAL AUTHOR(S)
Campbell, Roy C., and Campbell, Charlotte H. (HumRRO)

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM 89/01 TO 90/01	1990, March	

16. SUPPLEMENTARY NOTATION
Contracting Officer's Representative, Donald F. Haggard

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Threat analysis; Performance standards; Gunnery training; Standard setting; Threat-based training

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The objective of this study is to develop and test a strategy for organizing potential threat target arrays and engagement conditions (i.e., a threat domain) to measure tank gunnery training objectives. Analysis was conducted to identify the categories of information required when specifying the threat. Procedures were then developed to ensure that the categories were comprehensive, and to systematically reduce the categories to a manageable and realistic level of specific threat arrays. These procedures, which include seven activities, form the methodology. To determine the usefulness of the activities as a methodology, a tryout using projected threat capabilities was conducted by staff. The proposed threat determination methodology provides a framework that ensures comprehensiveness in the consideration of the dimensions in the threat domain. The seven activities provide a path for defining and specifying a threat-based scenario and adjusting that scenario to differing threat sizes and capabilities within an encounter.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION	
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Donald F. Haggard	22b. TELEPHONE (Include Area Code) (502) 624-3450	22c. OFFICE SYMBOL PERI-IK

DD Form 1473, JUN 86 *Previous editions are obsolete.* SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

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Methodology for Defining and Sampling from the Domain of Threat Conditions for Crew and Platoon Tactical Gunnery

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Department of the Army

March 1990

Army Project Number
2Q162785A790

Human Performance Effectiveness and Simulation

FOREWORD

Over the last 5 years, gunnery training developers have increasingly recognized the need to incorporate information concerning threat dispositions and capabilities into statements of conditions and standards. This research is intended to support that trend by proposing methods for systematically developing threat information into a description of the threat domain. That domain description can then be translated into training and testing objectives. The report is part of a series that addresses each phase of the training design process from domain definition, to objective identification, and finally, to training and testing strategy development. The purpose of the research is to ensure that armor platoon training makes optimal use of all gunnery training devices to meet realistic needs of the future battlefield.

This research is a part of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) task entitled "Application of Technology to Meet Armor Skills Training Needs." It is performed under the auspices of ARI's Armor Research and Development Activity at Fort Knox. The proponent for the research is the Deputy Chief of Staff, Training, Training and Doctrine Command (TRADOC).

The threat analysis methodology presented in this report was used by Doyle (1990) to produce a sample of threat target arrays that could be used as blueprints for setting up targets for single tank and platoon gunnery ranges. Those arrays have been used in a demonstration project by the Office of the Program Manager for Training Devices Development (PM-TRADE) at the Phantom Run Range at Fort Hood, Texas.

Access to some of the information sources in the report was provided by Mr. Dave Phipps of the Threat Division, United States Army Armor School, Fort Knox, Kentucky. However, all conclusions and procedures in this report are solely those of the authors and do not constitute endorsement or approval by the above-named individual or the U.S. Army Armor School.

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Technical Director

METHODOLOGY FOR DEFINING AND SAMPLING FROM THE DOMAIN OF THREAT CONDITIONS FOR CREW AND PLATOON TACTICAL GUNNERY

EXECUTIVE SUMMARY

Requirement:

The purpose of this study is to develop a strategy for organizing potential threat target arrays and engagement conditions (i.e., a threat domain) to be used to measure tank gunnery training objectives.

Procedures:

Analysis was conducted to identify the categories of information required when specifying the threat. Procedures were then developed to ensure that coverage of the categories was organized comprehensively, then systematically reduced to a manageable and realistic level of specific threat arrays. These procedures were specified in the form of seven activities, which form the methodology. To determine the usefulness of the activities as a methodology, a tryout was conducted by staff.

Findings:

The threat determination methodology provides a framework that ensures comprehensiveness in the consideration of the dimensions in the threat domain. The seven activities provide a path for defining and specifying a threat-based scenario and adjusting that scenario to differing threat sizes and capabilities within an encounter. The methodology works when applied to a specific threat and should prove adaptable when used by others or when applied to different threats.

Utilization of Findings:

The threat determination methodology will serve as a basis to develop a series of threat scenarios to support gunnery training objectives and will be available to update any future or changed threat requirements.

METHODOLOGY FOR DEFINING AND SAMPLING FROM THE DOMAIN OF THREAT CONDITIONS FOR CREW AND PLATOON TACTICAL GUNNERY

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Introduction

Statement of the Problem

The depiction of a battlefield threat is essential to any realistic tank gunnery training program, problem, or activity. Traditionally, field exercises, even at low level and even when conducted informally, will incorporate some threat description. Most military training developers are somewhat adept at utilizing and portraying a realistic threat scenario. Past and existing threat portrayals generally reflect the developer's competency, and have a high degree of training utility. The problem lies not in the product but in the lack of a systematic process. Without a documented procedure, each developer who must generate or replicate a training situation must essentially develop his or her own method of threat determination. Furthermore, there is no way of assessing the degree to which the domain of threat conditions has been adequately sampled.

Objective

The work described in this report comprises the development and tryout of a procedure for specifying threat conditions and selecting representative samples of conditions. It is primarily intended for a tank/fighting vehicle gunnery program, concentrating on training at the platoon level. However, the principles embedded in the methodology are applicable to any small unit (battalion) training situation which requires a threat. Specifically, the objective of this task is to develop a methodology for organizing the threat targets (tanks, BMP*, etc.) and other engagement conditions (smoke, Nuclear, Biological, Chemical (NBC), etc.) in such a way that no important threat types are omitted. Application of this methodology will produce sample threat target arrays that are indicative of the types of engagement situations that Armor platoons may face in combat. We will refer to this sample of arrays as a portrayal of the "threat domain."

Comparison with existing doctrine. This methodology is compatible with the doctrine and principles governing the production and use of the threat portion of intelligence preparation of the battlefield (IPB) as described in Field Manual (FM) 34-3, Intelligence Analysis. It also differs from that approach in the following ways:

1. Its aim and design is to support specifically defined training objectives.

2. It is intended for use by the individual who is not a trained or experienced intelligence analyst.

3. It considerably narrows the scope of the steps in intelligence processing (i.e., recording, evaluation, analysis).

*BMP is a Russian language abbreviation. Roughly translated the words it stands for mean *infantry combat vehicle*.

4. It eliminates Order of Battle factors which are not necessary to its limited aim.

5. Because of its more limited purview, it provides a specific, proceduralized method for achieving end products. It does so utilizing minimal resources.

Approach

In order to identify a domain of threat conditions, we proceed by degrees from a generalized definition to a more specific definition. Thus it is first necessary to define, however broadly, what we mean by threat. In this context, "the threat" consists of that which is encountered on the battlefield that must be defeated. Quite obviously, such a broad definition is of very little use, except in its circumscription of focus to battlefield conditions. To further refine the definition of the threat we would need to specify which battlefield (e.g., eastern European, against Warsaw Pact forces). We next prepare a listing of the parameters of the situation (e.g., unit type and weaponry). Note that, at this step, we are not yet providing values for the parameters, but are simply deciding what the parameters are that, when instantiated, fully describe the battlefield situation.

Only after the parameters are satisfactorily delimited can we finally provide values for those parameters. The values of the parameters may be described in any one of three ways: (1) by enumeration of all of the discrete values or nominates of the parameter, (2) by specifying ranges of possible values for infinite sets of values of numerical variables, or (3) by specifying rules determining membership in the set for the parameter.

The first step, to define the threat broadly, will yield somewhat different specifications for each application. For example, the threat that will be presented in an eastern European environment is different from the threat presented in a middle eastern conflict or a southeast Asia scenario. Thus the step is necessary, but it is not difficult.

Specifying the parameters of the threat situation is more challenging. Reference to Army literature (Department of the Army [DA], 1984a, 1984b, 1988) indicates that, at a minimum, the threat must be characterized in terms of the following parameters:

- Unit -- The various levels of organized bodies of troops and weapon systems utilized by the Red (i.e., enemy) forces in the selected theater (e.g., Airborne Regiment, Tank Division).

- Mission -- The specific combat operations that could be assigned to units (e.g., Deliberate Attack, Hasty Defense).

- Battlefield Systems -- The supporting tactical and logistical systems which the Red forces may employ (e.g., air support, indirect fire support).

- Composition -- The specific identification of the types of personnel, combat vehicles, weapons, and battlefield systems, and other tactical equipment and vehicles to be employed by the Red unit (e.g., T72 tank, infantry squad with grenade launchers).

- Strength -- The numbers of the items listed under Composition that will be employed by the Red side at any point in the engagement (usually expressed as a range).

- Dispersion -- The physical arrangement of the Red forces on the ground; including distance from the objective, identification of the items listed under Composition that can be seen, presentation aspect (e.g., front, rear, flank), and movement speed.

Having listed the relevant parameters and provided definitions for each of them, it remains to detail their allowable values. As stated above, this may be done by enumeration, by specifying a range of values, or by specifying rules for membership. We can easily enumerate and portray the appropriate elements for the first three parameters (Units, Missions, and Battlefield Systems). Not all of the combinations of units, missions, and battlefield systems are equally likely to occur. Knowledgeable analysts would eliminate those combinations that are incompatible or unlikely, i.e., certain missions for specific unit types, or certain battlefield systems in conjunction with specific unit types and missions.

The list of elements that would appear under Composition would be lengthy, but it would be a humanly possible task to prepare such a list. Its members should be identified by reference to specific unit types, missions, and/or battlefield systems. For any logical combination of unit, mission, and battlefield systems, certain elements (personnel types, weapon systems, equipment pieces) within the composition will be included of necessity, while others may be selected or not (e.g., a Motorized Rifle Regiment (BMP) in a meeting engagement, with reconnaissance, may or may not include BRDM* Chemical Reconnaissance vehicles, but will always include BMP Infantry Combat vehicles).

For the parameters of Strength and Dispersion, the variables are continuous in nature. Ranges of allowable values would have to be assigned for the personnel, weapon, and equipment types that were specified for Composition, and for the distances and movement rates of the Red force. The array or configuration on the ground of the Red vehicles and personnel would be determined by reference to the Unit, Mission, Strength, and distance from the objective.

The parameters listed above, which were derived by examination of DA publications on Warsaw Pact organization, weapons, and tactics, are reasonably comprehensive. The elements comprising the allowable value set for each parameter are defined by enumeration, range of values, or rules for membership. Together, the parameters and the rules defining their members (or the values themselves) would represent a formal table of domain specifications. It should be apparent that for each type of unit, each mission appropriate to that type unit, and a sampling of battlefield systems, the plausible personnel and weapon mixes under composition are numerous (but still finite); specifying the strength and dispersion of those weapons and personnel leads to unmanageable prolification.

*BRDM is a Russian language abbreviation. Roughly translated, the words it stands for mean *armored reconnaissance vehicle-wheeled.*

One way of managing the almost limitless listing of strength and dispersion factors for the unit, mission, battlefield system, and personnel and weapon composition mixes would be to somehow group the various strengths and dispersion arrays. Groupings could be based on lethality, or on judgments of likelihood, or on vulnerability, or on some other underlying characteristic. The table of specifications would then have defined, in a comprehensive, albeit not exhaustive, fashion, the threat conditions that would exist at the beginning of any mission. But without tracing those conditions through numerous engagements, there is no indication of what the threat conditions are after effects of Blue and Red operations and attrition are considered.

Sophisticated battle simulations and re-enactments have been used to define and capture threat conditions that would occur during the course of an engagement. They begin with a single set of battlefield conditions, specifying values and rules for parameters as described above, and then record numerous variations and battlefield developments; threat conditions are then defined by what occurs during the simulated or actual battles. The validity of the resulting data is claimed on the basis of the rules and assumptions (e.g., tactics, hit probabilities) governing the simulations; or, in the case of actual battles, validity of the domain is asserted on the grounds that the domain represents the historical course of the battle.

This approach has generated considerable interest in the recent past with the advent of more specialized computer programs targeted toward the complex wargaming required for simulations (e.g., LaFerriere, Chieffo, & Watson, 1987). Typically, the simulation begins with specification of a scenario based on theater and mission, involving a Blue unit (usually Task Force size or larger) against a Red unit of similar composition. These are then played out using a combat modelling simulation (such as CARMONETTE/T, JANUS, or CASTFOREM), which models force-on-force engagements. The aspects of combat modeled can include such considerations as terrain, mobility, weapons, sensors, effects of smoke and dust, and tactics, along with movement, target acquisition and selection, firing of weapons and impact of rounds, and communications activities of the forces. Specification of a given organization and tactics (e.g., eastern European, Warsaw Pact) control the actions of the Red forces, while U.S. organization and tactics control activities of the Blue force. Once the scenario parameters and rules of engagement are defined, the simulation is executed for a large number of replications (usually 30 - 50) of each scenario to produce multiple likely events and outcomes of the battle. The event histories recorded for analysis included such details as which weapons systems were fired at which targets, when, and where they were in relation to each other.

From the event histories, the empiricist can define and analyze engagements for any size element or unit and for each selected scenario. The product is a list of engagements that are unique with respect to such factors as the number and type of Red weapon system (e.g., T72 tank, BMP), and the range between the Red system and the Blue system with which it is exchanging fire. These engagements may have occurred at any time within the battle. They serve as one definition of the types of engagements that the chosen level of Blue force is likely to be involved in during the course of the battle.

This methodology for the definition of threat conditions relies on a complex and highly specific combat model. By executing the simulation

numerous times, event histories may be analyzed to define the domain of threat conditions as "threat conditions that did occur." Thus the domain is empirically defined. The empirical approach, using combat modelling techniques, has the advantage of being able to identify not only what the threat forces might look like (e.g., type, size, dispersion) at the beginning of an engagement, but also what the threat forces look like at various points during the engagement, given both the active and reactive operations of the Red and Blue forces. It also permits analysts to discover what portion of the threat force would likely be directed toward a single Blue tank platoon, that is, what the platoon slice might be.

At the same time, the empirical approach may be criticized on the grounds that it does not explicitly and systematically sample all levels and combinations of levels of various threat categories. Certainly the model described above does include categories such as terrain and movement. But, due to the stochastic nature of the approach, levels and combinations of levels are chosen according to their probability of occurrence. Thus there is no guarantee that complete coverage of the domain of conditions has been achieved. Only by playing out the scenarios exhaustively could such assurance be given.

Additional executions of the simulation would almost certainly yield different results, again due to the stochastic nature of the model, but these apparently different engagements would likely be judged as qualitatively the same, having no differential implications for gunnery performance. Changes in weapons systems or in the "rules" of Red or Blue organization or tactics, to reflect modernization or doctrine, would and should affect the outcome.

The final consideration of the efficiency of this empirical approach is the inherent complexity of such techniques. Most current simulations of force-on-force models require several thousands of data entries in order to adequately play out the battle events. Additionally, they require access to the modelling program, a sufficiently powerful computer, trained support staff, and time. Such requirements may be justified for specialized studies on large force engagements, but they are incompatible with the flexibility and accessibility required for lower level or less formal study.

One of the strongest features of the empirical approach is its facility for defining not only the starting point of an engagement, but also the progress of the engagement and the threat configuration (type, size, and dispersion) at selected points throughout the engagement. Without the resources for computer simulations, we cannot execute multiple iterations of battles to produce large samples of points within engagements. However, we can specify a limited number of points within an engagement, and describe possible threat configurations at just those points.

Specifying the points at which to describe the threat configuration, then, is the next problem. One approach to reducing variables such as range, which are continuous in nature, to discrete values is by grouping values on the basis of some consideration such as weapon lethality, vulnerability, or the particular range and time intervals at which certain key events occur (e.g., change in formation, employment of different weapons).

Organization of the Report

This report details a two-part methodology covering 1) the development of a table of domain specifications for threat conditions, and 2) steps required in generating representative samples from that table of domain specifications. In the next section of this report, "Development of the Table of Domain Specifications," we present our rationale for organizing the threat domain, which leads to the Table of Domain Specifications.

The following section, "Explanation of the Sampling Methodology," presents the activities and steps to be followed in preparing a representative sample of threat conditions from the Table of Domain Specifications.

The initial Table of Domain Specifications was refined by use of a series of tryouts of the sampling methodology, during which we also revised early versions of the sampling activities to make them suitable for different constraints on the threat domain. In this process, we developed several samples from the Table of Domain Specifications, for the threat domain based on present day doctrine and equipment. That threat domain sample, developed during the tryout, is referred to in the section on the Sampling Methodology for purpose of illustration and example. This current threat domain was updated against any changes in the 2-year (1990) and 10-year (1998) Threat.

This report is only a part of the proposed solution to the problem. A companion to this report, "Threat Presentations for Selected Battlefield Scenarios" (Doyle, 1989) gives specific threat portrayals selected for domain representation. Another report, on work designed to select the critical subsets of threat situations, combines the depicted threat with selected technical and doctrinal capabilities of friendly forces to reflect coverage of both threat and friendly capability domains (Campbell & Hoffman, 1990).

Development of the Table of Domain Specifications

Performance of this portion of the study has resulted in the development of a Table of Domain Specifications, which organizes the conditions of the threat domain. By the use of parameters of threat conditions, and the enumeration of members, specification of allowable ranges, or specification of rules for membership for each parameter, the Table represents a comprehensive model of the threat. However, it is constrained by certain restricting conditions concerning theater, time period, and scope. For purposes of developing the Table of Domain Specifications and trying out the Sampling Methodology, we began with the following three working conditions or constraints on the threat domain:

1. Warsaw Pact threat in an eastern European environment.

2. Threat equipment and doctrine as is currently defined, but reflecting the 1988-1998 time period.

3. Designed to support platoon level tank gunnery.

To the extent that these constraints do not match the goals of the user, the Table of Domain Specifications presented here will not be wholly useful. However, the steps required for development of the Table remain valid, and the

user may, by replicating those steps with different assumptions and constraints, prepare a more suitable Table.

Sources of Information

Once any assumptions or restrictions on the threat domain have been identified, the information sources to provide the necessary input for the procedure must be obtained. Because we used Warsaw Pact as the threat, we used primarily FM 100-2-1, -2, and -3 (DA, 1984a, 1984b, 1988) for information on threat organization, equipment, employment, and doctrine. Any replication which is based on different needs (such as a future threat or a threat tailored to a specific unit's war plan or deployment plan) must access corresponding information sources. Because knowledge about actual threat capabilities is constantly changing, any threat portrayal should be updated periodically by checking with G-2 or threat personnel. Some overall understanding of military terms, tactics, and relationships is necessary to employ the Sampling Methodology.

The Threat -- 1990-1998

The Soviet threat is, of course, dynamic, affected as much by political and economic considerations as by military strategy. The original plan of research called for looking at the European threat at two distinct points -- 1990 and 1998 -- on the assumption that updates would be prepared prior to these points. However, events within the Soviet Union since about 1988 have given threat analysts at least momentary pause until some clear indicators emerge. During participation in the Conventional Forces in Europe (CFE) talks in Vienna in early Spring 1989, the Soviets announced unilateral cuts of 5,000 tanks and 50,000 troops. In May 1989, North Atlantic Treaty Organization (NATO CFE) proposals offered Western cuts and equalization proposals that would reduce Warsaw Pact tanks by 37,000, Soviet troops by 1.75 million, and alliance armored troop carriers by 65,000.

While final force reductions are subject to negotiation and ratification, the earlier unilateral Soviet commitment would appear to shift Soviet organizations over to a more defensive posture. Both the Motorized Rifle Division and the Tank Division appear to be facing reorganization, probably being replaced with a "defensive mechanized infantry division" and a "combined arms division," both with different regimental alignments from their predecessors. Such changes could certainly affect the Unit list reflected in the Table of Domain Specifications developed for this report. Moreover, the unilateral adjustments appear to be occurring in the Soviet Operational Maneuver Group (OMG), which are the primary offensive deep strike capability of the Soviets. This, coupled with some confusing Soviet statements about "conventional reasonable defensive sufficiency" may mark a change in the 40-year old Soviet European doctrine.

In the area of equipment changes for 1990 and 1998, the projection is somewhat, but not altogether, clearer. And indeed, the Soviet economic considerations that are undoubtedly at least partially behind size and organizational adjustments could affect new equipment procurements as well.

Soviet tank development has traditionally followed a pattern of successive evolutionary designs until the introduction of the T64. This tank, incorporating significant engine, frontal armor, and main gun design changes,

marked a differing approach in Soviet main battle tank (MBT) design in that radical changes were introduced. The significance of the T64 was not clearly realized until the T80, as a completely different MBT from the T72 and T72M1, was finally introduced in about 1986. It would appear that the Soviets currently have two distinct MBTs for now and the future -- the T64-T80 and the T72-T72M1-M1986. Both tanks will undoubtedly play a role through 1998. Variants of both lines may be developed, and modification (such as the already observed explosive reactive armor packages) will undoubtedly occur in the more traditional Soviet development style. But a completely new future Soviet tank by 1998 does not now appear likely. The same would appear true for the Soviet infantry fighting vehicle, with the BMP-2 (with the Anti Tank (AT)5/SPANDREL) being the vehicle of the 1990s.

Tactical threats, even with technological breakthroughs or major doctrinal and organizational revisions, still tend to evolve and change slowly. While the specific threat must constantly be updated as new information is obtained, the small combat unit of the 1990s will still, in all likelihood, be faced with a threat armor, infantry, and artillery mix much akin to what is currently projected. Outside of some minor updating, we found little basis to change the threat from our tryout input and assumptions.

Threat Parameters and Elements, Ranges, or Rules for Membership

Table 1 contains the Table of Domain Specifications for Threat Conditions, listing the six parameters judged necessary for threat definition. These parameters were derived from an examination of the doctrinal threat template used in Intelligence Analysis (FM 34-3). By intent, the parameters ignore such real life order of battle considerations as unit history, training status, and personalities.

The parameters are defined differently. The first three parameters (Unit, Mission, and Battlefield Systems) are defined by enumeration; that is, the Table contains all of the known possibilities for defining those aspects of the threat (based on current time frame, Warsaw Pact, European theater). The next three parameters (Composition, Strength, and Dispersion) are defined based on the following rules.

COMPOSITION:

For each type of Unit and Battlefield System, identify the type of personnel, weapons, and equipment.

- Personnel: List, by type, only personnel who are not mounted in vehicles or not part of a weapon systems crew.
- Weapons: Identify by nomenclature or end item description, all systems capable of producing casualties or destroying material except individual weapons.
- Equipment: Identify by nomenclature or description all equipment, other than weapons systems and individual equipment. List equipment which will physically appear on the battlefield and which can have an immediate impact on the tactical engagement.

Table 1

Table of Domain Specifications for Threat Conditions

I. UNIT

Motorized Rifle Division	Airborne Battalion
Tank Division	Motorized Rifle Company (BMP)
Airborne Division	Motorized Rifle Company (BTR)
Motorized Rifle Regiment (BMP)	Tank Company
Motorized Rifle Regiment (BTR)*	Airborne Company
Tank Regiment	Motorized Rifle Platoon (BMP)
Airborne Regiment (BMD)	Motorized Rifle Platoon (BTR)
Motorized Rifle Battalion (BMP)	Tank Platoon
Motorized Rifle Battalion (BTR)	Airborne Platoon
Tank Battalion	

II. MISSION

March	Pursuit
Meeting Engagement	Hasty Defense
River/Obstacle Crossing	Prepared Defense
Movement to Contact	Withdrawal
Deliberate Attack	Relief
Breakthrough	Rear Area Security
Envelopment	Special Operations
Exploitation	

III. BATTLEFIELD SYSTEMS

Air Defense	Air Support-Tactical Aircraft (TACAIR)
Communications	Air Support (Helicopter)
Reconnaissance	Smoke
Rear Services	NBC
Command/Control	Electronic Warfare
Engineers	Fire Support (Artillery/Rocket)
Anti-Tank	Fire Support (Missile)

IV. COMPOSITION

Personnel
Weapons
Equipment

V. STRENGTH (of items in IV)

How many, of what composition?

VI. DISPERSION (of items in III, IV, and V)

Distances
Movement speed

*BTR is a Russian language abbreviation. Roughly translated, the words it stands for mean *armored personnel carrier.*

STRENGTH:

Based on the Unit and Mission selected, identify the numbers of personnel, weapons, and equipment identified under Composition.

Identify or depict graphically, based on the numbers identified above, the formation, array, sequence, or interval of the personnel, weapons, and equipment that will appear on the battlefield. This assembly is dependent on the unit/battlefield systems selected, the mission, and the threat doctrine that accompanies that mission.

DISPERSION:

Distances: Based on a European scenario and the tactical employment of the level of units considered, maximum distance for consideration is 4000 meters. (Minimum distance is the objective, or the location of the threat forces, both of which are 0.) Within the 0-4000 meter range, identify (based on Unit and Mission) where the following occurs:

- Forces change formation or tactics.
- Weapons systems capabilities or vulnerabilities change.

Speed: Mechanized unit (mounted) speed will be 0-20 kilometers per hour (KPH). Unit dismounted speed will be 0-6 KPH.

This concludes the portion of the Methodology for defining the domain specifications for threat conditions. The products from and rules from this section feed directly into Part Two of the Methodology which concerns the sampling from this domain.

Explanation of the Sampling Methodology

In following the Sampling Methodology, the Table of Domain Specifications is the input for certain decisions concerning the Red unit, mission, composition, and strength. The product of this decision-making process is portrayed in a format that we have termed an "Initial Scenario Brief." In formulating the Methodology, we performed a series of tryouts, using present day doctrine for Warsaw Pact threat. In the process, we prepared several Initial Scenario Briefs. The steps required in sampling from the Table of Domain Specifications to develop or to review and update an Initial Scenario Brief make up the first part of the Sampling Methodology.

Once the Initial Scenario Brief is prepared and deemed suitable for the user's purpose, additional Scenario Briefs are needed to indicate how the situation develops throughout the engagement. The second part of the Sampling Methodology provides guidance on how to generate Subsequent Scenario Briefs to depict the changes in the threat configuration over time as a result of Red loss, terrain feature interference, introduction of new forces, or changes in mission.

In summary, the Sampling Methodology is organized as an outline to guide the analyst or threat developer through a systematic process of threat

determination. It is presented in a series of Activities which are supported by enabling or interim Steps. For the most part, the Activities and the Steps are not independent, and the analytic process must often be employed iteratively. Decisions or changes made at each point should generate a review of the entire process to discover any unforeseen impact.

The primary focus of the Sampling Methodology is to reduce to a manageable level the vast amount of interacting information with which the analyst would normally be faced. We aimed at systematically and reasonably reducing large lists to smaller lists. However, it was not always possible to develop a logic that led inevitably to a single choice. Sometimes the reduction only limits the number of choices, and the final selection made by the analyst will either be arbitrary or based on considerations outside of the Sampling Methodology.

Development Strategy

In trying to fix the procedures of the Sampling Methodology, our approach was to perform all the activities required in an actual threat determination. We used a currently defined Soviet threat in terms of tactics, organization, and equipment. In the explanation of the development of the Sampling Methodology, we cite alternatives and decisions using these constraints on the threat parameters. However, these citations are examples only, and are used only to illustrate how the Sampling Methodology can and should be applied. A replication using the Sampling Methodology on a refined future threat or different threat would use different input, i.e., a modified Table of Domain Specifications, and would likely have different choices, alternatives, and decision points.

There are three considerations that overlay the procedures that follow and which the developer must keep in mind when applying the procedure. Although not a distinct part of the methodology, these three factors have a significant impact on the decisions and employment of the Methodology.

1. Blue Forces. The Sampling Methodology does not specifically address the employment and activities or specific composition of Blue. Yet the analyst will be primarily concerned with the type, level, and training goals of Blue. Indeed, decisions made about the threat are usually based on the planned training of Blue. While this is compatible with the Methodology, such user-unit considerations are generally external to the Methodology itself.

2. Terrain. Of necessity, the Sampling Methodology is terrain independent. But when the outcomes of the Methodology are employed, whether that be on a range, field exercise, simulation, or map exercise, they become very terrain dependent. Distances, arrays, speeds, and even missions will depend on the dictates of the actual terrain. This may affect how the analyst works, in one of two ways: First, of course, the analyst may apply the Methodology based on an actual piece of terrain and this will influence his or her decisions in ways not reflected in the proceduralized steps. Second, the analyst may treat the outcomes of the Methodology as a plan or blueprint, subject to modification in application to terrain.

3. Decision Process. For the most part, the proceduralized steps that follow are interactive; that is, decisions made at one point determine or limit the decisions made at another point. Therefore the analyst must perform

the methodology iteratively and should become familiar with the entire Methodology before employing it. No outcome or decision should be finalized until the entire Methodology is completed.

At Appendix A, the framework of the Sampling Methodology is presented. What follows here is how we developed that framework, and examples (using current threat and current equipment for tryout) of how it is to be applied. In the following sections, we detail the seven Activities that we developed to produce Initial Scenario Briefs and Subsequent Scenario Briefs. These seven Activities and the supporting Steps, as shown in Figure 1, constitute an outline of the Sampling Methodology.

In performing these seven Activities, certain decisions were made to group or limit some factors, or to select among other factors. In the discussion which follows, we detail the decisions and give our rationale for deciding as we did. This information is presented so that the user is not only able to judge the adequacy of the approach, but also is enabled to replicate the decision-making process with alternate responses, reflecting different needs or changes to threat doctrine or equipment. Performance of the first five Activities leads to production of an Initial Scenario Brief. Should threat weapons, tactics, or organization change, or the user arrive at different conclusions about the input, the five Activities would be performed again, the decisions modified and a new Initial Scenario Brief would result.

This product of the first five Activities, the Initial Scenario Brief, then serves as input to Activities 6 and 7. They guide the user through the procedures in using the Initial Scenario Brief to generate various engagement arrays of Red forces, given the different levels of Loss Rates and the Range Line specifications. As a result of work with the Initial Scenario Brief and the two remaining Activities, the user produces a series of Subsequent Scenario Briefs. These are depictions of enemy forces, which may be used in designing ranges or gunnery tables, in planning simulator-based exercises or table top tactical exercises, and so on. As the Sampling Methodology is used to prepare new or revised Initial Scenario Briefs, it will also be used to generate additional threat portrayals. A small amount of randomness is deliberately included in the Methodology loss rate consideration.

Activities

Activity 1: Designate Red Organization and Composition

The domain of organizations of the Red Force is shown in Table 1 under the headings of "Unit" and "Battlefield Systems". This domain is defined primarily by the strategic theater.

There are two Steps required in this Activity. Both focus on the selection of units and capabilities to be included in the threat specification.

Step 1: Select Tactical Unit.

The purpose of this step is to designate the organizational level of tactical threat unit to be employed. While ultimately the threat unit selected is the analyst's choice, it should be based on the following considerations:

Activity 1: Designate Red Organization and Composition

Step 1: Select Tactical Unit

Step 2: Select Battlefield Systems

Activity 2: Define Red Missions

Activity 3: Deploy Threat Unit

Step 1: Select Red Unit Formation

Step 2: Describe Unit Equipment/Personnel

Step 3: Describe Battlefield Systems (Scenario Enhancements)

Step 4: Select Distances and Frontages

Step 5: Determine Threat Slice

Activity 4: Determine Range Lines and Encounter Rates

Step 1: Specify Range Lines

Step 2: Specify Encounter Times

Activity 5: Prepare Initial Scenario Brief

Activity 6: Designate Loss Rates

Activity 7: Prepare Subsequent Scenario Briefs

Step 1: Determine number of remaining threat systems at each Range Line for each Loss Rate

Step 2: Determine configuration of Red force at each Range Line

Figure 1. Activities and steps in the Sampling Methodology for definition of the threat domain.

1. The higher the expected frequency of encountering a unit on the battlefield, the more likely it is that the unit should be selected.

2. The normal tactical employment of the threat unit selected should be compatible with the training objective(s) for which the threat is being developed.

3. When a level of unit is selected, that unit will come with all subordinate units. That is, the regiment will come with battalions, companies and platoons; battalions will come with companies and platoons; etc. During selection of unit level to focus on, some lower level units will be incompatible because they are not jointly employed, and will therefore drop off the list. Under normal threat development, only one unit (type and level) is selected; the subordinate units are included by implication.

During the tryout of the Methodology, because we were focussed on training at the platoon level, we tried to keep the Red organization at a plausibly low level. Ultimately we selected the regiment as the proper threat level because it was this level that would be charged with a variety of offensive and defensive missions. It was also the lowest threat level that presents a representative slice of battlefield support resources from division and higher. (As will be discussed later, selection of the threat at regiment level does not mean that the entire regiment must be employed or displayed -- this is only the threat level of focus for the ensuing analysis.) The Motorized Rifle Regiment (MRR) (BMP) was selected because it is more common (i.e., greater numbers) than Tank Regiments, and requires a more comprehensive mix of weapons systems (more lethal) than the MRR (BTR).

Step 2: Select Battlefield Systems.

Battlefield systems are those assets and resources, not organic to the maneuver force selected in Step 1, that can be used to influence or control the events on the battlefield. Although there will be some overlap, battlefield systems are kept distinct from organic assets at battalion level and below. Thus, for example, while a battalion has anti-tank capability, it would normally not be listed as a "battlefield system"; however, a regimental antitank capability would be so listed.

Table 1 lists the domain of battlefield systems. To select from this domain, the guidelines are:

1. Select only battlefield systems that are not organizationally part of the Unit selected (Step 1).

2. Select as separate battlefield systems only those located at regiment and above.

3. Select only battlefield systems that would physically operate within the area of operations of the portion of the unit depicted.

4. Do not select battlefield systems that have a low probability of being encountered or that do not influence the employment of unit for which the threat is being used to train.

All probable battlefield systems that meet the selection criteria should be identified. As will be discussed later, this does not mean that all battlefield systems identified will be employed in the scenario.

During the tryout, we identified the following battlefield systems as meeting the requirements of the restricted domain:

- Engineer (obstacles)
- Air Support (high performance aircraft)
- Air Support (helicopter)
- Smoke
- Electronic Warfare
- Fire Support (artillery)
- NBC

Activity 2: Define Red Missions

The goal of this activity is to specify what the threat unit is doing. The domain of missions (as befits the European theater) is listed in Table 1. Before selecting one or more missions to be portrayed, the mission domain should be narrowed by applying the following rules:

1. Drop missions that are not performed by the type and size threat unit selected in Activity 1.

2. If some of the missions are, in effect, not different from each other when performed at the level of the threat unit selected, retain one of those duplicative missions and drop the rest.

3. Unless preparing for some specialized training, drop threat missions that are so specialized that they will be rarely encountered.

4. Select missions that support the training goals of the force to be supported by the threat development.

All missions that meet, or are not excluded by, these criteria should be identified.

During the tryout of the methodology, we performed a subjective, but careful analysis of the Table 1 Mission domain using the rules above, a consideration of our threat unit selected (MRR), and keeping in mind our training objective (tank platoon gunnery training). We found that some missions differed only on a matter of degree (for example, Hasty Defense and Prepared Defense being two points along the same continuum) and could therefore be consolidated. Other missions (for example, Deliberate Attack and Exploitation) had no significant differences at the regimental level. Finally, still other missions (such as River/Obstacle Crossing and Rear Area Security) were so specialized that for our training objectives, they would fit only a very distinctive, restricted scenario. The result, for our purposes, was the following list of missions:

- Meeting Engagement
- Deliberate Attack
- Hasty/Prepared Defense
- Withdrawal
- Breakthrough

Activity 3: Deploy Threat Unit

Activity 3 builds on the decisions previously made. It is the most complex and lengthy of all the Activities and involves the most decision points. The end result is the description and physical portrayal of the threat as it would appear on an unspecified battlefield.

There are five Steps to completing Activity 3. It should be noted that many of the decisions required in performing the Steps would normally be decided based on specific characteristics of terrain or what would be known about the opposing force. However, of necessity, threat portrayals at this juncture are independent of those factors. When the threat portrayed is actually implemented, terrain in particular must be a consideration. But this is normally not the responsibility of the threat developer at this point.

Step 1: Select Red Unit Formation.

The purpose of this Step is to put the threat unit into a configuration having width, depth, and an organizational presentation that is consistent with threat doctrine. The combination of threat unit and mission are the primary determinants of threat formation. Threat doctrine will specify the order in which subordinate units will normally appear on the battlefield when performing the selected mission. The same source will generally specify the arrangement of individual elements (vehicles) and units into formative arrays. These arrays will normally be linear or columnar (or some variation of those), but are normally highly terrain dependent. Because the analyst is working independently of terrain, a decision must often be made based on other factors. The following rules should be followed:

1. If given, select the formation that doctrine indicates will be most preferred or most frequent.

2. If appropriate, vary the formations for different situations so that both linear targets and arrays in depth are offered.

The formation selected for a given situation is an initial configuration at the starting point of the engagement. Formation is affected more than any other factor during later activities in the Methodology, when loss rates and closing ranges are being introduced in preparation of Subsequent Scenario Briefs.

Step 2: Describe Unit Equipment/Personnel.

The purpose of this Step is to designate the equipment and personnel that will be portrayed. Equipment descriptions are generally available in unclassified publications for current equipment. Future equipment and capabilities may require access to special resources. A list of all unit equipment and personnel is neither practical nor desirable. Use the following rules in compiling the list:

1. List all weapon systems capable of producing casualties or destroying material except individual weapons.

2. List equipment which will physically appear on the battlefield and which can have an immediate impact on the tactical engagement; e.g., list command and control vehicles but do not list radio sets.

3. List only tactical equipment (as opposed to support or logistical equipment) unless there is a special mission selected that would entail portrayal of such equipment.

4. List by type only personnel who are not mounted in vehicles (at the time of portrayal) or not part of a weapon system crew; e.g., list dismounted infantry, snipers, sappers; do not list mounted infantry, Anti-Tank (AT) crews.

5. Based on the unit and mission, identify how many of each item listed will exist in the scenario.

When working with threat equipment of generally recognized capabilities and vulnerabilities, it is usually sufficient to note the accepted nomenclature (e.g., T72, AT-4). However, if improved or future threat vehicles and weapons are being incorporated into a scenario, it is important to include as much detail as necessary so that a proper assessment of capabilities and vulnerabilities impact on the training objectives can be made.

Step 3: Describe Battlefield Systems (Scenario Enhancements).

Although there is some overlap in capabilities, battlefield systems assets are kept distinct from the organic threat capabilities at battalion level and below. This is because battlefield systems are normally controlled by regiment and higher, and their appearance on the battlefield will be circumstantial and situational. When employing battlefield systems, it is not necessary or desirable to include systems in all scenarios. In fact, over-inclusion of systems is not only unrealistic, but can sometimes interfere with the training objectives.

The descriptions of battlefield systems must be similar to the weapons, equipment, and personnel descriptions for organic unit assets in the preceding step. This is fairly straightforward where the systems concerned constitute targets (e.g., ground reconnaissance, DF artillery, helicopters) but requires a slightly different approach where targeting is not involved (e.g., NBC, electronic warfare (EW), engineer). The use, extent, and influence of these latter systems must be fully described.

To maximize both coverage and flexibility, battlefield systems are employed through what we call Scenario Enhancements. That is, they are developed and kept separate from any particular scenario. They can then be employed, at the time of implementation, as the developer sees the need in the Initial or Subsequent Scenarios. Most scenarios can support more than one Enhancement, if the training need can be justified.

There are three essential parts to the battlefield system description comprised by a Scenario Enhancement. These are:

1. The Battlefield System Composition. List what it is that will deliver or provide the battlefield system. Do this regardless of whether it will be portrayed as a battlefield target.

2. The Battlefield System Disposition. Describe what the system can do. This may be in terms of time, coverage, ordnance delivered, area affected, or other capability of influence on the battlefield.

3. The Battlefield System Employment. Describe where or when the system will normally be used in employment. Some systems may be used throughout (e.g., fire support), while others may be more prevalent during certain missions (e.g., engineer barriers in the defense), or within certain range lines (e.g., tactical air support).

An example of a Scenario Enhancement, describing Red indirect fire, is contained at the end of Appendix B.

Step 4: Select Distances and Frontages.

This Step is designed to give further specificity to the threat by putting the threat formation (selected in Step 1 of this Activity) into a theoretical physical space. Threat frontages and distances are generally described in threat doctrine. However, most threat distances are described in terms of a range rather than as an absolute distance. The following rules are therefore used for selection:

1. Except for spaces between vehicles, distances and frontages must be selected, even though doctrine offers a range. Although these distances may have to be adjusted when arrays are actually set up on a particular target range, the threat arrays should produce a start point.

2. Select overall unit and formation frontages and depths first; measures within the formation usually must conform proportionately to overall dimensions of the unit.

3. Distances selected toward the low end of the range (closer together) provide more targets but can also increase the concentration effect of the threat.

4. If doctrine offers a range on distances, and there is no other factor that gives preference to an exact point in the range to select, choose, as a default, the midpoint.

5. An exception to the requirement for distance specificity applies to individual vehicles. While individual vehicles will always be a measurable distance from other vehicles, that distance will vary from 50 to 100 meters under "normal" terrain conditions. Therefore assign random distances of 50 to 100 meters to inter-vehicle distances.

Step 5: Determine Threat Slice.

Activities and Steps to this point have all focussed on delimiting and defining the threat by reference to established doctrine, organizations, formations, and equipment. Yet there is an element of chance in what any Blue force is realistically faced with on the battlefield. Further, small tactical units, on either side, do not operate as isolated entities on the battlefield. For example, a Blue platoon in the defense will not suffer the entire force of a Motorized Rifle Regiment attack being spent on it, but will generally see only a segmented aspect (physically or by time) of the MRR. A friendly tank platoon may play only an initial or brief role in an action before being maneuvered elsewhere. On the other hand, it would serve no purpose to fully portray tactical options (including reserve and bypass operations) without regard to training objectives and the level of unit being trained. For example, if the training objective was platoon tank gunnery, the unit being trained must have sufficient, but not overwhelming, numbers of targets at which to shoot.

The approach, then, is to exercise some control over what portions of the overall threat is allowed to "enter" the Blue environment, and to keep the slice in line both with the training objective(s) and with a realistic potential for survivability. To do this, we delineated the following rules in determining the slice:

1. Determine from doctrinal sources the Blue unit's frontage and area of responsibility. Overlay this on the threat formation portrayal for an initial approximation of the threat. Do this separately for each type and level of unit being trained separately (e.g., squad, platoon, team).

2. Keep threat units relatively intact if possible (e.g., platoon, company). This is in keeping with the doctrine of threat tactical employment and will facilitate later threat manipulation.

3. Utilize threat doctrinal offensive and defensive force ratios which are specified in threat descriptive literature to make adjustments in the slice.

4. Generally, weight the threat slice more heavily initially. Lesser ratios will result when loss rates are factored in later in the Methodology.

5. Vary the slice from the normal "head-to-head" initial meeting normally portrayed by considering flank, oblique, and even rear slices.

Activity 4: Determine Range Lines and Encounter Rates

In any engagement there are critical points where key occurrences or changes take place. In order to complete the threat presentation, it is necessary to identify these points. This is done by performing two steps that reduce the critical points to space (distance) and time (movement rate) occurrences. Both of these variables are used later to determine threat attrition presentations.

Step 1: Specify Range Lines.

The purpose of this Step is to pick significant points on the battlefield to "freeze", so that particular events can be portrayed. In reality, the fluid battlefield may contain many such critical events, most of which are terrain determined or event driven. The analyst must review the threat doctrinal literature as well as being aware of friendly capabilities and his or her own training objectives in selecting these ranges. The focus is on selecting ranges that are tied to significant occurrences and changes in the capabilities, structures, or employment, or which constitute tactical decision points. This may result in identification of more points than can be utilized. The following rules should be applied to defining range lines:

1. No range line should be beyond the limits of intervisibility (as generally determined by the theater), or the effective range of direct fire weapons, whichever is closer.

2. Select as range lines those points where weapons systems capabilities are maximized or where those capabilities come to affect the tactical outcome of the battle.

3. Select range lines where doctrine requires a change in actions or employment. The more significant or critical that change, the higher the priority that the point be selected as a designated range line.

4. Range lines may vary by mission or encounter; there is no requirement that they be the same for all scenarios. Nor is there a requirement that range lines be evenly spaced.

5. To allow for the utilization of attrition and loss rates, each scenario should have a minimum of two range lines. While there is no absolute maximum, to allow for the portrayal of maneuver, it is recommended that there be a minimum of 200 meters between range lines.

In our tryouts, our analysis of current Red offensive operations produced the following range lines based on the listed events:[1]

Range Line 0 - 3000 meters - Limit of intervisibility.
Range Line 1 - 2000 meters - Maximum effectiveness of threat tank main gun capability.
Range Line 2 - 1000 meters - Assume assault formation. Concentrate and consolidate fires.
Range Line 3 - 400 meters - Dismount assault infantry.

For current threat defensive operations, our tryout analysis resulted in the same ranges, but for different reasons, as follows:

Range Line 0 - 3000 meters - Limit of intervisibility.
Range Line 1 - 2000 meters - Maximum effectiveness of threat tank main gun capability.

[1]An exception was the Red Breakthrough when the portrayal starts at the line of contact.

Range Line 2 - 1000 meters - Shift threat defensive positions.
Consolidate fires.
Range Line 3 - 400 meters - Quit defensive position.

Step 2: Specify Encounter Times.

Encounter times are calculated as the distance between range lines, divided by doctrinal speed. They are designed to give some time limits to each phase of offensive threat engagement. When the threat is on the defense and stationary, encounter times are computed based on Blue offensive movement rates.

During our tryouts, we used the current movement rates cited in threat literature. For ranges greater than 400 meters, the movement rate is 20 KPH. For ranges 400 meters and below, the movement rate is 6 KPH. Based on our ranges selected in Step 1, we calculated the following offensive encounter times:[2]

Traverse from Line 0 to Line 1 in 3 minutes.
Traverse from Line 1 to Line 2 in 3 minutes.
Traverse from Line 2 to Line 3 in 2 minutes.
Traverse from Line 3 to Blue position in 4 minutes.

Note that Encounter Times are not to be confused with exposure times. Within the overall encounter time, individual vehicle exposure time will vary but will normally be much less. Exposure times are not computed in this part of the threat analysis.

During our tryout we did not close any forces to less than 400 meters (range line 3).

Activity 5: Prepare Initial Scenario Brief

A means is required to capture and present the results of the developer's effort. The vehicle for summarizing the results is termed an Initial Scenario Brief (the qualifier "Initial" is used to indicate that the threat at this point has not yet been affected by Blue actions; the encounter is about to begin).

The main purpose of an Initial Scenario Brief is to document the decisions made by the threat developer and to tabulate a succinct description of the threat and how it will be employed. It is not meant to capture the Steps and Activities in the Methodology, nor to display a defense of the developer's decisions. It is intended to be the product of those decisions, and to be utilized for further training development.

An example of an Initial Scenario Brief which was developed during our tryout is shown in Appendix B. Although the format of the Initial Scenario Brief can be tailored to fit any requirements, our analysis shows the essential content to be as follows:

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[2]Again, the portrayal of the Red Breakthrough used different times and distances.

1. A descriptive title that specifies the encounter situation.

2. A threat unit description.

3. An threat equipment description, including numbers of each.

4. A narrative description of the threat disposition, including distances.

5. An identification of the range lines.

6. An identification of the encounter times, keyed to the range lines.

7. A symbolic and (preferably) drawn-to-scale portrayal of the threat.

Activity 6: Designate Loss Rates

The purpose of this Activity is to define rates (percentages) that will describe losses to the Red forces during the course of the encounter. By introducing varying rates for reducing the number of threat targets, a variety of different realistic threat arrays will be developed for presentation in training. The purpose is not to portray precisely the effects of Red and Blue gunnery, nor to model engagement events. Such modelling would require consideration of range dependence in the capabilities of weapon systems (i.e., firing rates, average hit probabilities, and lethality), which is beyond the scope of the Sampling Methodology. Rather, the purpose is to introduce, systematically, a variety of threat configurations at different ranges.

This Activity uses the product of Activity 3 (Deploy Threat Unit), which comprises Red/Blue ratios that are heavily weighted in favor of the threat forces. As stated previously, this was done deliberately: By presenting threat-heavy conditions initially, subsequent scenarios can posit and present the effects of varying reduced levels of Red forces, and thus provide a variety of threat conditions at different ranges.

The reductions are based on considerations of Red probabilities of success after specified losses within given periods of time or at given ranges. These specified losses should be derived from the threat descriptive literature. Although losses and loss rates are continuous, there are generally accepted critical loss rates, which are breakpoints in terms of continued effectiveness or mission success. For the Methodology, the critical loss rates at the range line closest to the Blue should be specified according to the following considerations:

1. The high loss rate is defined as the percentage of Red initial strength at which Red success becomes doubtful at a given range. Any loss percentage greater than that, at the given range, makes Red success unlikely.

2. The low loss rate is defined as the percentage of Red initial strength at which Red success is very likely at a given range. For any loss percentage lower than that at the given range, Red success is highly probable.

In our tryout, we defined the High Loss Rate to be 50% (or more) of the Red force between the initial position at 3000 meters and the dismount or final position at 400 meters. The Low Loss Rate we defined to be 20% (or

less) of the Red force between the initial position at 3000 meters and the dismount or final position at 400 meters.

For Red forces in the offensive, the High and Low Loss Rates are interpreted as follows, based on current threat doctrine:

1. If the Red force has lost 50% or more of its initial strength at the time of dismount (within 400 meters of the Blue force), then Red success is doubtful.

2. If the Red force has lost 20% or less of its initial strength at the time of dismount, Red success is likely.

For Red defensive engagements, similar presumptions are made:

3. If the Blue force has depleted the Red by 50% or more by the time they close to 400 meters, then Red viability is doubtful.

4. If the Blue force has depleted the Red by 20% or less by the time they close to 400 meters, then Red will still be viable.

The encounter times determined as products of Activity 4 are used to distribute the Red losses among the different ranges specified for portrayal. In both cases (high and low loss), the Red losses will be specified to occur uniformly throughout the time required to traverse the distance from the furthest range line to the closest range line to Blue forces. Projecting the amount of loss between range lines is a simple matter of dividing the total Red loss in proportion to the time required to traverse each range band.

Thus in our tryout we determined the following Red loss percentages at each range line:

At Line 1: High Loss Rate is 18.75% of the initial force.
Low Loss Rate is 7.5% of the initial force.

At Line 2: High Loss Rate is an additional 18.75% of initial force, for a cumulative loss of 37.5%.
Low Loss Rate is an additional 7.5% of the initial force, for a cumulative loss of 15%.

At Line 3: High Loss Rate is an additional 12.5% of the initial force, for a cumulative loss of 50%.
Low Loss Rate is an additional 5% of the initial force, for a cumulative loss of 20%.

The High and Low Loss Rate percentages at each range line are the product of this Activity. Because they are a function of three sets of decisions (predicted Red viability given specified loss percentages, Range Line specifications, and movement speeds that result in Encounter Times), an analyst's modification of any of those decisions will have an impact on these Red loss rates.

It should be emphasized again that the purpose of introducing Red loss considerations is <u>not</u> to model precisely the effects of Red and Blue gunnery, nor is it a playing out of the events in the engagement. Obviously, the rates

are based on Red losses and expectations of success. Despite this approach to reducing the threat, the product -- smaller numbers of threat targets -- represents not only varying levels of loss, but also effects of dust or smoke and of terrain. The overriding purpose of the threat reduction is to serve the need for specifying and representing a variety of threat arrays in a realistic fashion.

Activity 7: Prepare Subsequent Scenario Briefs

In this Activity, an Initial Scenario Brief is further developed by consideration of the doctrinal changes in threat disposition (formation, frontage and depth, and movement direction) at selected ranges. Loss rate percentages generated for the selected Range Lines are also applied during this Activity to devise alternate scenarios.

The two Steps in this Activity will be performed for each Initial Scenario Brief, for each specified Range Line within a given Initial Scenario Brief, and for each Loss Rate at those Range lines. (In our tryouts, with three Range Lines per Encounter Situation and two Loss Rates, six Subsequent Scenarios Briefs per Initial Scenario would be required.) As with the Initial Scenario Briefs, these Subsequent Scenario Briefs represent products of decisions, designed for further use in designing training.

Step 1: Determine number of remaining threat systems at each Range Line for each Loss Rate.

In performing Activity 6, the analyst designated High and Low Loss Rates, and listed the reduction percentages to be applied to Red forces at each of the Range Lines specified in Activity 4. Now those percentages are used to delete from the threat display the corresponding numbers of Red weapon systems listed in Activity 3.

There are several considerations in actually applying the Loss Rate percentages:

1. Note that these percentages and numbers of systems are cumulative, in order that the Red force be depleted by the total high or low loss percentage between the two extreme range lines.

2. The reduction percentages are applied to the number of Red weapon systems as portrayed in the Initial Scenario Brief, at the beginning of the encounter.

3. Because the percentages will often lead to fractions of systems being erased (half a tank, for example), some rounding will be necessary. Overall, the total systems deleted under the High Loss Rate condition should be rounded up (to greater than 50% loss), if rounding is necessary, while the total number should be rounded down (to fewer than 20% lost) in the Low Loss Rate condition. Within Loss Rate conditions, rounding should favor greater reduction at closer ranges, as weapon lethality increases.

4. If only one or two types of weapons were listed in the initial array, they may be proportionately reduced; in general, though, reduction should be applied strictly randomly to the Red unit equipment items listed in the Initial Scenario Brief.

Step 2: Determine configuration of Red force at each Range Line.

The Range Lines delineated in Activity 4 are not arbitrary. They are inter-force ranges where significant changes or events occur. Weapons become more accurate, formations change, troops are deployed, and so on. The threat mission is presumed to be unchanged. The Red weapon array has been reduced in the previous Step to reflect High or Low Loss Rate. The configuration or disposition (formation, frontage and depth, direction) of the remaining weapon systems will consequently change because of the interacting effects of mission, time elapsed, closer range, and remaining strength.

In performing this Step, the developer uses the numbers of Red weapon systems remaining at each Range Line (determined in the previous Step) and knowledge of the changes in threat configuration (derived from threat tactical doctrine) to place those systems in physical relation to each other. The configurations should be both described and drawn, resulting in production of the Subsequent Scenario Briefs. In format and content, these products resemble closely the Initial Scenario Briefs, comprising the following elements of information:

1. A descriptive title identifying the relevant Initial Scenario Brief and the Range Line and Loss Rate for the particular Subsequent Scenario.

2. An equipment description, including numbers of each.

3. A narrative description of the threat disposition, including distances.

4. A symbolic and (preferably) drawn-to-scale portrayal of the threat presentation.

An example of a Subsequent Scenario Brief is shown in Appendix B.

Conclusion

The Sampling Methodology for threat domain definition makes use of the parameters included in the Table of Domain Specifications for Threat Conditions, and provides a framework that ensures consideration of all levels of those parameters. It leads the user through the procedures used to define and instantiate all relevant parameters of threat conditions, and to sample from the Table of Domain Specifications in order to prepare or to update an Initial Scenario Brief. It then details the steps necessary to generate the Subsequent Scenario Briefs to portray changed and reduced threat arrays, which reflect changes in threat formation at different ranges and as the result of threat losses, deteriorating intervisibility, or terrain.

Appendix A of this report is a summary of the Methodology. It presents the Activities and Steps in the Methodology without lengthy examples or commentary. It is a stand-alone document only in the sense that the user who has read and understands the explanation of the Methodology in the body of this report may thereafter use the presentation in Appendix A to guide other threat domain definitions.

Any of the choices or decisions made in designing the Scenario Briefs may be challenged. The decisions concerning the unit type, mission, size, weapon mix, formation, location -- these and any other decisions may be modified by other experts on threat conditions. But the Methodology is robust with respect to such changes. Whatever the outcome at any of the decision points, if the decisions can be made, then the Methodology can be used.

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Appendix A

Methodology for Defining and Sampling From the Domain of Threat Conditions

This Methodology provides guidance to the analyst in making certain decisions concerning the Red unit, mission, composition, strength, and configuration. The product of this decision-making process will then be portrayed in a format termed an "Initial Scenario Brief."

Once the Initial Scenario Brief is prepared and deemed suitable for the user's purpose, additional Scenario Briefs are needed to indicate how the situation develops throughout the engagement. The second part of the methodology provides guidance on how to generate Subsequent Scenario Briefs to depict the changes in the threat configuration over time as a result of mission changes, Red losses, or force composition.

In summary, the Methodology is organized as an outline to guide the analyst or threat developer through a systematic process of threat determination. It is presented in a series of Activities which are supported by enabling or interim Steps (see Figure A-1). For the most part, the Activities and the Steps are not independent, and the analytic process must often be employed iteratively. Decisions or changes made at each point should generate a review of the entire process to discover any unforeseen impact.

The primary focus of the Methodology is to reduce to a manageable level the vast amount of interacting information with which the analyst would normally be faced. Its aim is to systematically and reasonably reduce large lists to smaller lists. However, it is not always possible to develop a logic that leads inevitably to a single choice. Sometimes the reduction only limits the number of choices, and the final selection made by the analyst will either be arbitrary or based on considerations outside of the Methodology.

When applying the Methodology, the analyst must first ascertain and define any goals and assumptions, restrictions or limitations applying to the particular situation. Once any assumptions or restrictions on the threat domain have been identified, the individual who uses this Methodology must obtain the information sources to provide the necessary input for the procedure. Any replication which performs the analysis based on particular needs (such as a changed threat or a threat tailored to a specific unit's war plan or deployment plan) must access corresponding information sources.

Activity 1:	Define Red Organization and Composition
Step 1:	Select Tactical Unit
Step 2:	Select Battlefield Systems
Activity 2:	Define Red Missions
Activity 3:	Deploy Threat Unit
Step 1:	Select Red Unit Formation
Step 2:	Describe Unit Equipment/Personnel
Step 3:	Describe Battlefield Systems (Scenario Enhancements)
Step 4:	Select Distances and Frontages
Step 5:	Determine Threat Slice
Activity 4:	Determine Range Lines and Encounter Rates
Step 1:	Specify Range Lines
Step 2:	Specify Encounter Times
Activity 5:	Prepare Initial Scenario Brief
Activity 6:	Designate Loss Rates
Activity 7:	Prepare Subsequent Scenario Briefs
Step 1:	Determine number of remaining threat systems at each Range Line for each Loss Rate
Step 2:	Determine configuration of Red force at each Range Line

Figure A-1. Activities and steps in the Sampling Methodology for definition of the threat domain.

Table A-1

Table of Domain Specifications for Threat Conditions

I. UNIT

Motorized Rifle Division
Tank Division
Airborne Division
Motorized Rifle Regiment (BMP)
Motorized Rifle Regiment (BTR)
Tank Regiment
Airborne Regiment (BMD)
Motorized Rifle Battalion (BMP)
Motorized Rifle Battalion (BTR)
Tank Battalion
Airborne Battalion
Motorized Rifle Company (BMP)
Motorized Rifle Company (BTR)
Tank Company
Airborne Company
Motorized Rifle Platoon (BMP)
Motorized Rifle Platoon (BTR)
Tank Platoon
Airborne Platoon

II. MISSION

March
Meeting Engagement
River/Obstacle Crossing
Movement to Contact
Deliberate Attack
Breakthrough
Envelopment
Exploitation
Pursuit
Hasty Defense
Prepared Defense
Withdrawal
Relief
Rear Area Security
Special Operations

III. BATTLEFIELD SYSTEMS

Air Defense
Communications
Reconnaissance
Rear Services
Command/Control
Engineers
Anti-Tank
Air Support (TACAIR)
Air Support (Helicopter)
Smoke
NBC
Electronic Warfare
Fire Support (Artillery/Rocket)
Fire Support (Missile)

IV. COMPOSITION

Personnel
Weapons
Equipment

V. STRENGTH (of items in IV)

How many, of what composition?

VI. DISPERSION (of items in III, IV, and V)

Distances
Movement speed

Activity 1: Define Red Organization and Composition

The domain of organizations of the Red force is shown in Table 1 under the headings "Unit" and "Battlefield Systems. This domain is defined primarily by the strategic theater selected.

There are two Steps required in this Activity. Both focus on selection of units and capabilities.

Step 1: Select Tactical Unit.

The purpose of this step is to designate the organizational level of tactical threat unit to be employed. This selection should be based on the following considerations:

1. The higher the expected frequency of encountering a unit on the battlefield, the more likely it is that the unit should be selected.

2. The normal tactical employment of the threat unit selected must be compatible with the training objective(s) for which the threat is being developed.

3. When a level of unit is selected, that unit will come with all subordinate units. Under normal threat development, only one unit (type and level) is selected; the subordinate units are included by implication.

Step 2: Select Battlefield Systems.

Battlefield Systems are those assets and resources that can be used to influence or control the events of the battlefield. Table 1 lists the domain of Battlefield Systems. To select form this domain, the guidelines are:

1. Select only battlefield systems that are not organizationally part of the Unit selected to be represented (Step 1).

2. Select as separate battlefield systems only those located at regiment and above.

3. Select battlefield systems that would physically operate within the area of operations of the portion of the unit depicted.

4. Do not select battlefield systems that have a low probability of being encountered or that do not influence the employment of the unit for which the threat is being used to train.

All probable battlefield systems that meet the selection criteria should be identified.

Activity 2: Define Red Missions

The goal of this Activity is to specify what the threat unit is doing. The domain of missions (as befits the European theater) is listed in Table 1, The mission domain should be narrowed by applying the following rules:

1. Drop missions that are not performed by the type and size threat unit selected in Activity 1.

2. If some of the missions are, in effect, not different from each other when performed at the level of the threat unit selected, retain one of those duplicative missions and drop the rest.

3. Unless preparing for some specialized training, drop threat missions that are so specialized that they will be rarely encountered.

4. Select missions that support the training goals of the force to be supported by the threat development.

All missions that meet, or are not excluded by, these criteria should be selected.

Activity 3: Deploy Threat Unit

Activity 3 builds on decisions already made and is designed to provide a specific description and a physical portrayal of the threat as it would appear on an unspecified, terrain independent, battlefield. There are five Steps to complete Activity 3.

Step 1: Select Red Unit Formation.

This Step puts the threat unit into a configuration having width, depth, and an organizational presentation that is consistent with threat doctrine, as specified by threat doctrinal guidance for threat unit and mission. In choosing the formation, follow these rules:

1. If given a choice of formations, select the one that doctrine indicates will be most preferred or most frequently used by the threat.

2. If appropriate, vary the formations for different situations so that both linear targets and arrays in depth are offered.

Generally, the formations selected for a given situation is an initial configuration at the start of an engagement.

Step 2: Describe Unit Equipment/Personnel.

The purpose of this Step is to designate the equipment and personnel that will be portrayed. Use the following rules in compiling the list:

1. List all weapon systems capable of producing casualties or destroying material except individual weapons.

2. List equipment which will physically appear on the battlefield and which can have an immediate impact on the tactical engagement.

3. List only tactical equipment (versus support or logistical equipment) unless there is a special mission selected that would entail portrayal of such equipment.

4. List, by type, only personnel who are not mounted in vehicles (at the time of portrayal) or not part of a weapon system crew.

Step 3: Describe Battlefield Systems (Scenario Enhancements).

Battlefield Systems are described through Scenario Enhancements. Each Battlefield System selected in Activity 1 will have its own Scenario Enhancement. They are developed separately from the scenario and are then combined with any scenario on a selective basis to alter the training conditions. There are three essential parts of a Battlefield System Scenario Enhancement:

1. The Battlefield System Composition. List what it is that will deliver or provide the battlefield system. Do this regardless of whether it will be portrayed as a battlefield target.

2. The Battlefield System Disposition. Describe what the system can do. This may be in terms of time, coverage, ordnance delivered, area affected, or other capability of influence on the battlefield.

3. The Battlefield System Employment. Describe where or when the system will normally be used in employment. Some systems may be used throughout, while others may be more prevalent during certain missions, or within certain range lines.

Step 4: Select Distances and Frontages.

This Step is designed to give further specificity to the threat by putting the threat formation into a theoretical physical space. Threat frontages and distances are generally described in threat doctrine, however, most threat distances are described in terms of a range rather than as an absolute distance. Therefore, the following rules are used for selection of distances and frontages:

1. Except for spaces between vehicles, exact distances and frontages must be selected, even though doctrine offers a range.

2. Select overall unit an formation frontages and depths first; measures within the formation usually must conform proportionately to overall dimensions of the unit.

3. Distances selected toward the low end of the range (closer together) provide more targets but can also increase the concentration effect of the threat.

4. If doctrine offers a range on distances, and there is no other factor that give preference to an exact point in the range to select, choose the midpoint. This is more important to follow when the range limits are extreme.

5. An exceptions to the requirement for distance specificity applies to individual vehicles. While individual vehicles will always be a measurable distance from other vehicles, that distance will vary from 50 to 100 meters under "normal" terrain conditions. Therefore, assign random distances to 50 to 100 meters to inter-vehicle distances.

Step 5: Determine Threat Slice.

The purpose of this step is to exercise some control over what of the overall threat is allowed to "enter" the Blue environment, and to keep this threat slice in line both with the training objective(s) and with a realistic potential for survivability. The following rules are used to determine the threat slice:

1. Determine from doctrinal sources the Blue unit's frontage and area of responsibility. Overlay this on the threat formation portrayal for an initial approximations of the threat. Dot this separately for each type and level of unit being trained separately.

2. Keep threat units relatively intact if possible.

3. Utilize threat doctrinal offensive and defensive force ratios which are specified in threat descriptive literature to make adjustments in the slice.

4. Generally, weight the threat slice more heavily initially. Lesser ratios will result when loss rates are factored in later.

5. Vary the slice from the normal "head-to-head" initial meeting normally portrayed by considering flank, oblique, and even rear, slices.

Activity 4: Determine Range Lines and Encounter Rates

In any engagement there are critical points where key occurrences or changes take place. In order to complete the threat presentation, it is necessary to identify these points. This is done by performing two steps that reduce the critical points to space (distance) and time (movement rate) occurrences.

Step 1: Specify Range Lines.

The purpose of this step to pick significant points on the battlefield to "freeze", so that particular events can be portrayed. The focus is on selecting ranges that are tied to significant occurrences and changes in the capabilities, structures, or employment, or which constitute tactical decision points. This may result in identification of more points than can be utilized. The following rules should be applied to defining range lines:

1. No range line should be beyond the limits of intervisibility (as generally determined by the theater), or the effective rang of direct fire weapons, whichever is closer.

2. Select as range lines those points where weapons systems capabilities are maximized or where those capabilities come to affect the tactical outcome of the battle.

3. Select range lines where doctrine requires a change in actions or employment. The more significant or critical that change, the higher the priority that the point be selected as a designated range line.

4. Range lines may vary by mission or encounter; there is no requirement that they be the same for all scenarios. Nor is there a requirement that range lines be evenly spaced.

5. To allow for the utilizations of attrition and loss rates, each scenario should have a minimum of two range lines. While there is no absolute maximum, to allow for the portrayal of maneuver; it is recommended that there be a minimum of 200 meters between range lines.

Step 2: Specify Encounter Times.

Encounter times a calculated as the distance between range lines, divided by doctrinal speed. They are designed to give some time limits to each phase of offensive threat engagement. When the threat is on the defensive and stationary, encounter times are computed based on Blue offensive movement rates.

Note that encounter times are not to be confused with exposure times. Within the overall encounter time, individual vehicle exposure time will vary but will normally be much less. Exposure times are not computed in this part of the threat analysis.

Activity 5: Prepare Initial Scenario Brief

Although the format of the Initial Scenario Brief can be tailored to fit any requirements, the essential content is as follows:

1. A descriptive title that specifies the encounter situation.

2. A threat unit description.

3. An threat equipment description, including numbers of each.

4. A narrative description of the threat disposition, including distances.

5. An identification of the range lines.

6. An identification of the encounter times, keyed to the range lines.

7. A symbolic and (preferably) drawn-to-scale portrayal of the threat.

Activity 6: Designate Loss Rates

The purpose of this Activity is to define rates (percentages) that will describe losses to the Red forces during the course of the encounter. By introducing varying rates for reducing the number of threat targets, a variety of different realistic threat arrays will be developed for presentation in training.

This Activity uses the product of Activity 3 (Deploy Threat Unit), which comprises Red/Blue ratios that are heavily weighted in favor of the threat forces. By presenting threat-heavy conditions initially, subsequent scenarios can present the effects of varying reduced levels of Red forces, and thus provide a variety of threat conditions at different ranges.

The reductions are based on considerations of Red probabilities of success after specified losses within given periods of time or at given ranges. Although losses and loss rates are continuous, there are generally accepted critical loss rates, which are breakpoints in terms of continued effectiveness or mission success. For the Methodology, the critical loss rates at the range line closest to the Blue should be specified according to the following considerations:

1. The high loss rate is defined as the percentage of Red initial strength at which Red success becomes doubtful at a given range. Any loss percentage greater than that, at the given range, makes Red success unlikely.

2. The low loss rate is defined as the percentage of Red initial strength at which Red success is very likely at a given range. For any loss percentage lower than that at the given range, Red success is highly probable.

For Red forces in the offensive, the High and Low Loss Rates are interpreted as follows:

1. If the Red force has lost 50% or more of its initial strength at the time of dismount (within 400 meters of the Blue force), then Red success is doubtful.

2. If the Red force has lost 20% or less of its initial strength at the time of dismount, Red success is likely.

For Red defensive engagements, similar presumptions are made:

3. If the Blue force has depleted the Red by 50% or more by the time they close to 400 meters, then Red viability is doubtful.

4. If the Blue force has depleted the Red by 20% or less by the time they close to 400 meters, then Red will still be viable.

Activity 7: Prepare Subsequent Scenario Briefs

In this Activity, an Initial Scenario Brief is further developed by consideration of the doctrinal changes in threat disposition (formation, frontage and depth, and movement direction) at selected ranges. Loss rate percentages generated for the selected Range Lines are also applied during this Activity to devise alternate scenarios.

The two Steps in this Activity will be performed for each Initial Scenario Brief, for each specified Range Line within a given Initial Scenario Brief, and for each Loss Rate at those Range lines.

Step 1: Determine number of remaining threat systems at each Range Line for each Loss Rate.

The High and Low Loss Rates and reduction percentages designated to be applied to Red forces at each of the Range Lines specified in Activity 4, are now used to delete from the threat display the corresponding numbers of Red weapon systems listed in Activity 3.

There are several considerations in applying the Loss Rate percentages:

1. These percentages and numbers of systems are cumulative, in order that the Red force be depleted by the total high or low loss percentage between the two extreme range lines.

2. The reduction percentages are applied to the number of Red weapon systems as portrayed in the Initial Scenario Brief, at the beginning of the encounter.

3. When percentages lead to fractions of systems being erased (half a tank, for example), some rounding will be necessary. Overall, the total systems deleted under the High Loss Rate condition should be rounded up, if necessary, while the total number should be rounded down in the Low Loss Rate condition. Within Loss Rate conditions, rounding should favor greater reduction at closer ranges, as weapon lethality increases.

4. If only one or two types of weapons were listed in the initial array, they may be proportionately reduced; in general, though, reduction should be applied strictly randomly.

Step 2: Determine configuration of Red force at each Range Line.

The Range Lines delineated in Activity 4 are inter-force ranges where significant changes or events occur. The threat mission and Blue mission are presumed to be unchanged. The Red weapon array has been reduced in the previous Step to reflect High or Low Loss Rate. The configuration or disposition (formation, frontage and depth, direction) of the remaining weapon systems will consequently change because of the interacting effects of mission, time elapsed, closer range, and remaining strength.

In performing this Step, the developer uses the numbers of Red weapon systems remaining at each Range Line (determined in the previous Step) and knowledge of the changes in threat configuration, to place those systems in physical relation to each other. The configurations should be both described and drawn, resulting in production of the Subsequent Scenario Briefs, comprising the following elements of information:

1. A descriptive title identifying the relevant Initial Scenario Brief and the Range Line and Loss Rate for the subject brief.

2. An equipment description, including numbers of each.

3. A description of threat disposition, including distances.

4. A symbolic and (preferably) drawn-to-scale portrayal of the threat presentation.

Appendix B

Sample Scenario Briefs

Initial Scenario Brief
Subsequent Scenario Brief
Scenario Enhancement

Initial Scenario Brief 1.0: Red Attack vs. Blue Defense

Threat Unit: Motorized Rifle Battalion with Tank Company Attached

Threat Composition:
12 T-80 tanks
24 BMP-2 Armored Infantry combat vehicles with AT-5, 30mm automatic gun, carrying infantry squads of 7 troops and one RPG-14 each
4 BMP-2 with AT-5 and 30mm automatic gun, command vehicles

Threat Disposition at Initiation (see Figure B-1):

The formation occupies a frontage of 1500 meters and a depth of 400 meters.

The formation consists of three companies on line, with a tank platoon attached to each company.

Each company occupies a 500 meter front, and a depth of 400 meters.

Companies are separated by 50 meters. BMP within companies are separated by 50 - 100 meters.

Range Lines:
Line 0: 3000 meters
Line 1: 2000 meters
Line 2: 1000 meters
Line 3: 400 meters

Encounter Rates: For $\geq$ 400 meters, 20 KPH. For $\leq$ 400 meters, 6 KPH.
Traverse from Line 0 to Line 1 in 3 minutes.
Traverse from Line 1 to Line 2 in 3 minutes.
Traverse from Line 2 to Line 3 in 2 minutes.
Traverse from Line 3 to Blue platoon in 4 minutes.

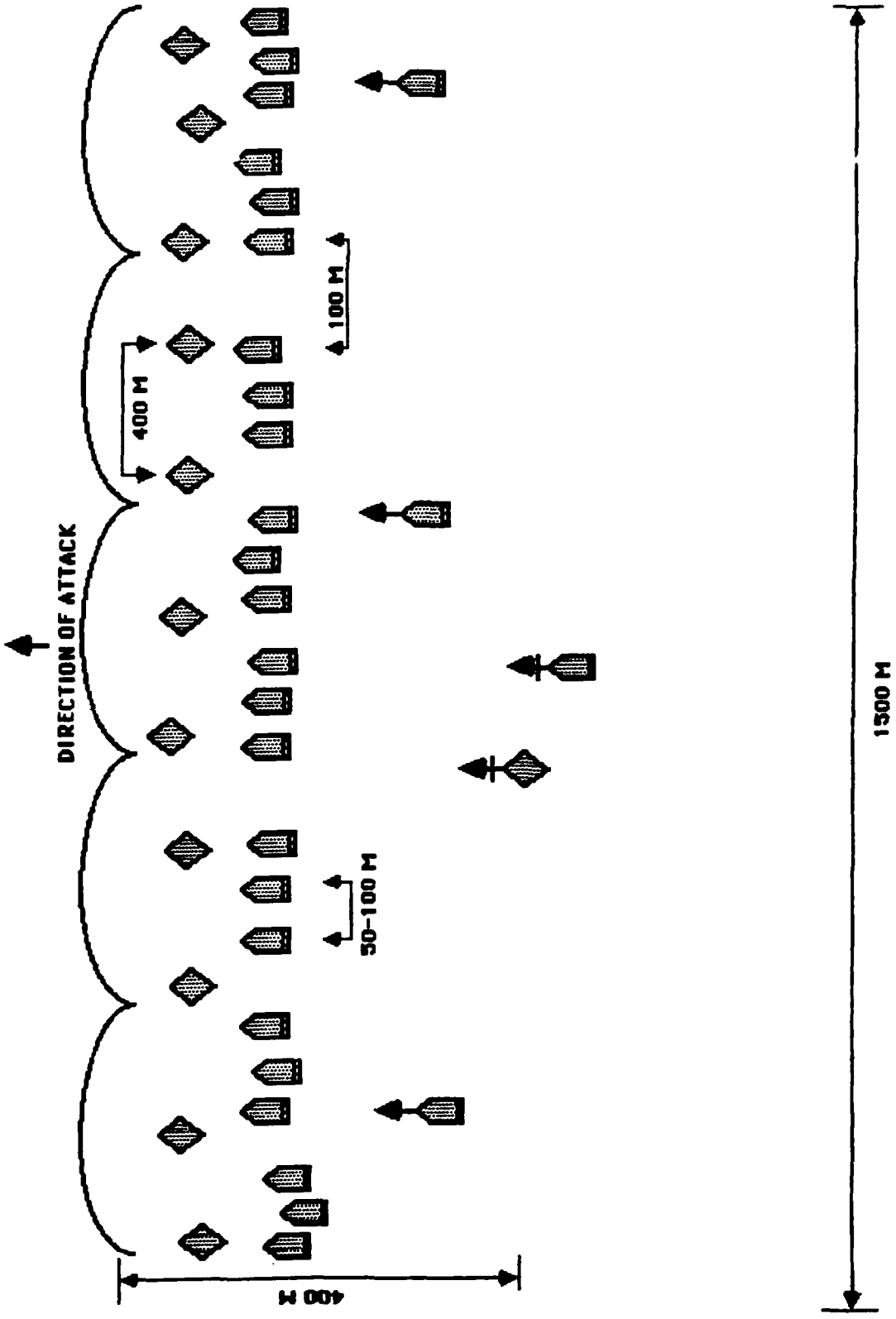

Figure B-1. Red attack vs. Blue defense (1.0.) (Motorized rifle battalion with attached tank company as part of regimental first echelong attack).

Subsequent Scenario Brief 1.1: Red Attack vs. Blue Defense

Threat Unit: Motorized Rifle Battalion with Tank Company Attached

Range Line: Line 1: 2000 meters

Loss Rate: High - 7 systems (7 systems cumulative)

Threat Composition:
- 10 T-80 tanks
- 19 BMP-2 Armored Infantry combat vehicles with AT-5, 30mm automatic gun, carrying rifle squads of 7 troops and one RPG-14 each
- 4 BMP-2 with AT-5 and 30mm automatic gun, command vehicles

Threat Disposition at 2000 meters (see Figure B-2):

The Motorized Rifle Battalion has deployed into an attack formation. The formation is led by the tanks on line, followed by the infantry platoons, also on line.

The front and depth of the formation remains unchanged.

The formation occupies a frontage of 1500 meters and a depth of 400 meters.

The formation consists of three companies on line, with a tank platoon attached to each company.

Each company occupies a 500 meter front, and a depth of 400 meters.

Companies are separated by 50 meters. BMP within companies are separated by 50 - 100 meters.

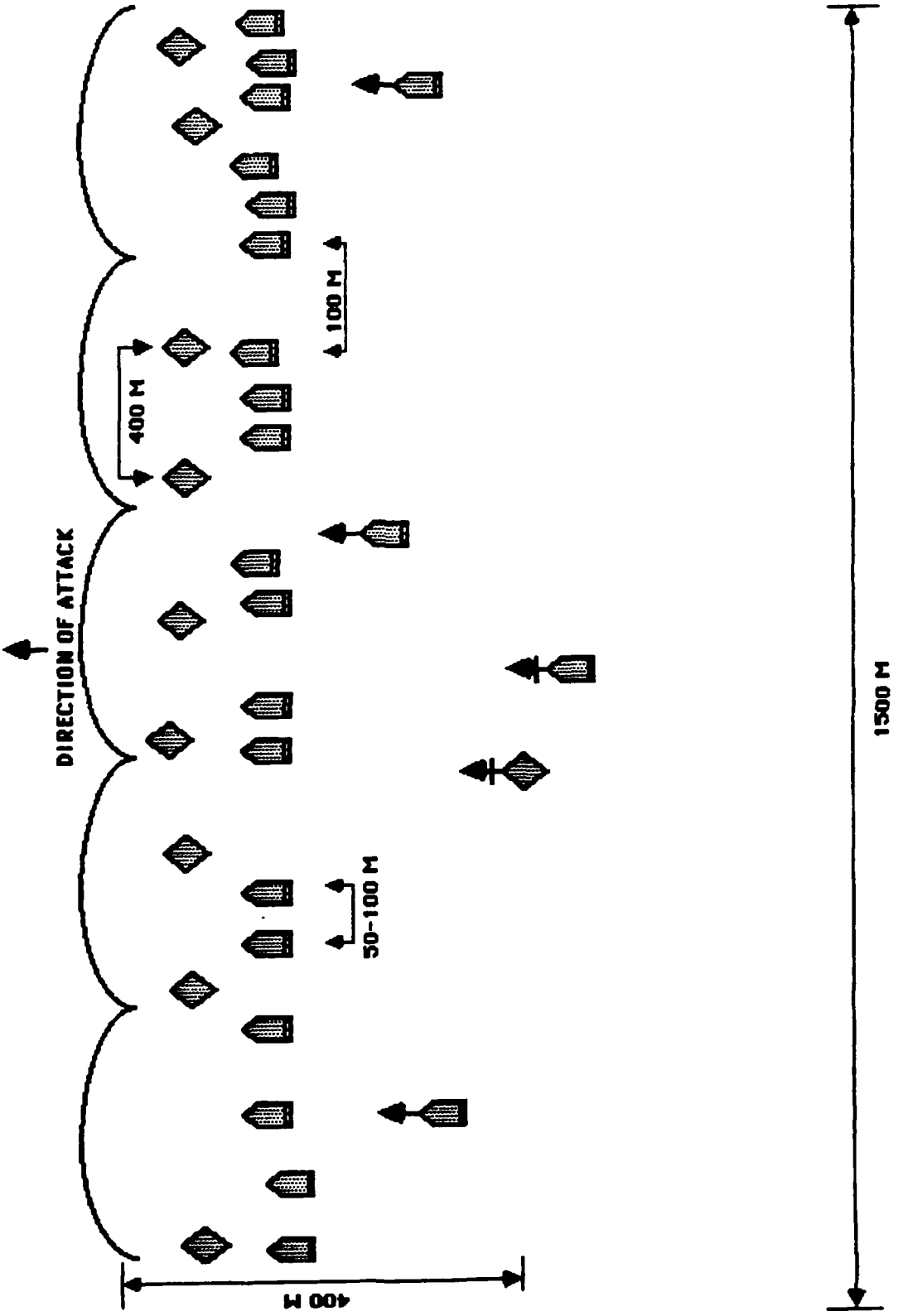

Figure B-2. Red attack vs. blue defense (1.1.) (Motorized rifle battalion with attached tank company as part of regimental first echelon attack).

Subsequent Scenario Brief 1.2: Red Attack vs. Blue Defense

Threat Unit: Motorized Rifle Battalion with Tank Company Attached

Range Line: Line 1: 1000 meters

Loss Rate: High - 8 systems (15 systems cumulative)

Threat Composition:
- 8 T-80 tanks
- 4 BMP-2 Armored Infantry combat vehicles with AT-5, 30mm automatic gun, carrying rifle squads of 7 troops and one RPG-14 each
- 3 BMP-2 with AT-5 and 30mm automatic gun, command vehicles

Threat Disposition at 1000 meters (see Figure B-3):

The frontage and depth of the formation is maintained but intervals among individual vehicles, platoons, and companies widen as vehicles maneuver to fill gaps caused by attrition.

The formation occupies a frontage of 1500 meters and a depth of 400 meters.

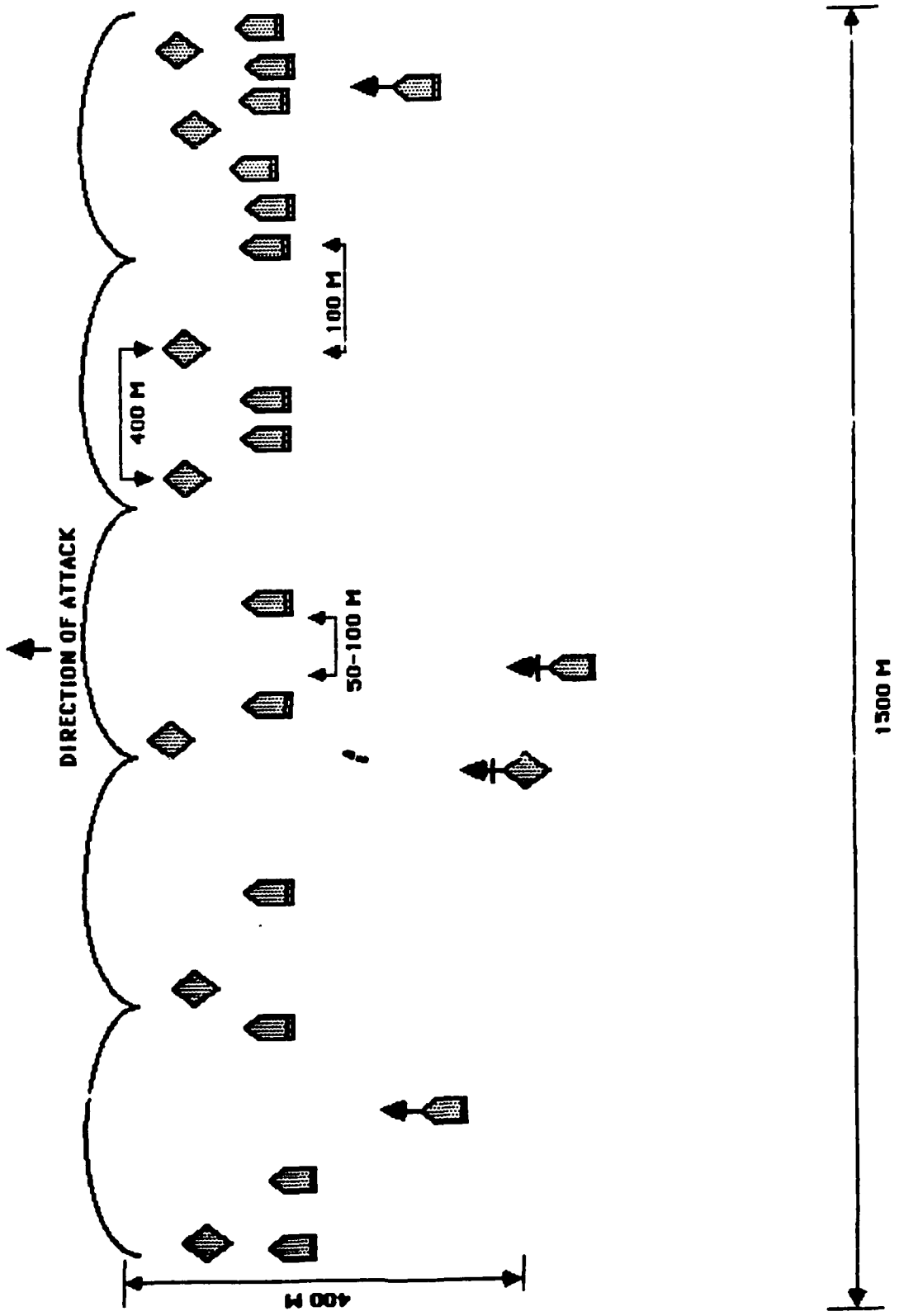

Figure B-3. Red attack vs. Blue defense (1.2.) (Motorized rifle battalion with attached tank company as part of regimental first echelon attack).

Subsequent Scenario Brief 1.3: Red Attack vs. Blue Defense

Threat Unit: Motorized Rifle Battalion with Tank Company Attached

Range Line: Line 1: 400 meters

Loss Rate: High - 5 systems (20 systems cumulative)

Threat Composition:
- 7 T-80 tanks
- 11 BMP-2 Armored Infantry combat vehicles with AT-5, 30mm automatic gun, carrying rifle squads of 7 troops and one RPG-14 each
- 2 BMP-2 with AT-5 and 30mm automatic gun, command vehicles

Threat Disposition at 400 meters (see Figure B-4):

The speed of the formation has slowed to 6 KPH. Companies remain separated by 50 meters, vehicles within companies have closed to 50 - 100 meters of each other. The infantry platoons are dismounted and following behind the tanks. The BMPs are following the dismounted infantry by 100 meters.

The overall formation width is reduced to 750 meters. Second echelon, follow-on forces (not represented) are moving forward to fill the attrition gaps and to expand the battalion width back to 1500 meters.

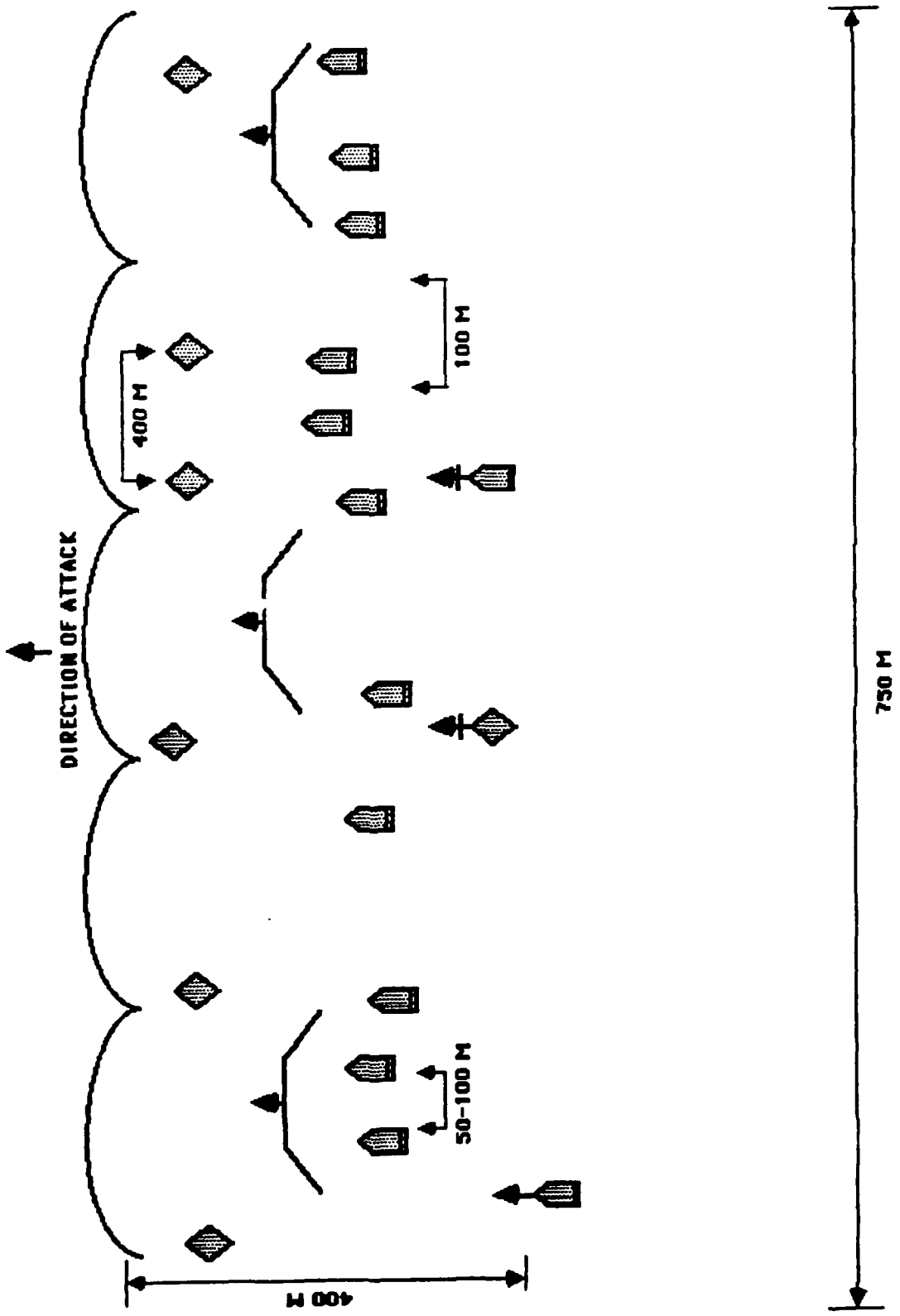

Figure B-4. Red attack vs. Blue defense (1.3.) (Motorized rifle battalion with attached tank company as part of regimental first echelon attack).

Subsequent Scenario Brief 1.4: Red Attack vs. Blue Defense

Threat Unit: Motorized Rifle Battalion with Tank Company Attached

Range Line: Line 1: 2000 meters

Loss Rate: Low - 3 systems (3 systems cumulative)

Threat Composition:
- 10 T-80 tanks
- 23 BMP-2 Armored Infantry combat vehicles with AT-5, 30mm automatic gun, carrying rifle squads of 7 troops and one RPG-14 each
- 4 BMP-2 with AT-5 and 30mm automatic gun, command vehicles

Threat Disposition at 2000 meters (see Figure B-5):

The Motorized Rifle Battalion has deployed into an attack formation. The formation is led by the tanks on line, followed by the infantry platoons, also on line.

The front and depth of the formation remains unchanged.

The formation occupies a frontage of 1500 meters and a depth of 400 meters.

The formation consists of three companies on line, with a tank platoon attached to each company.

Each company occupies a 500 meter front, and a depth of 400 meters.

Companies are separated by 50 meters. BMP within companies are separated by 50 - 100 meters.

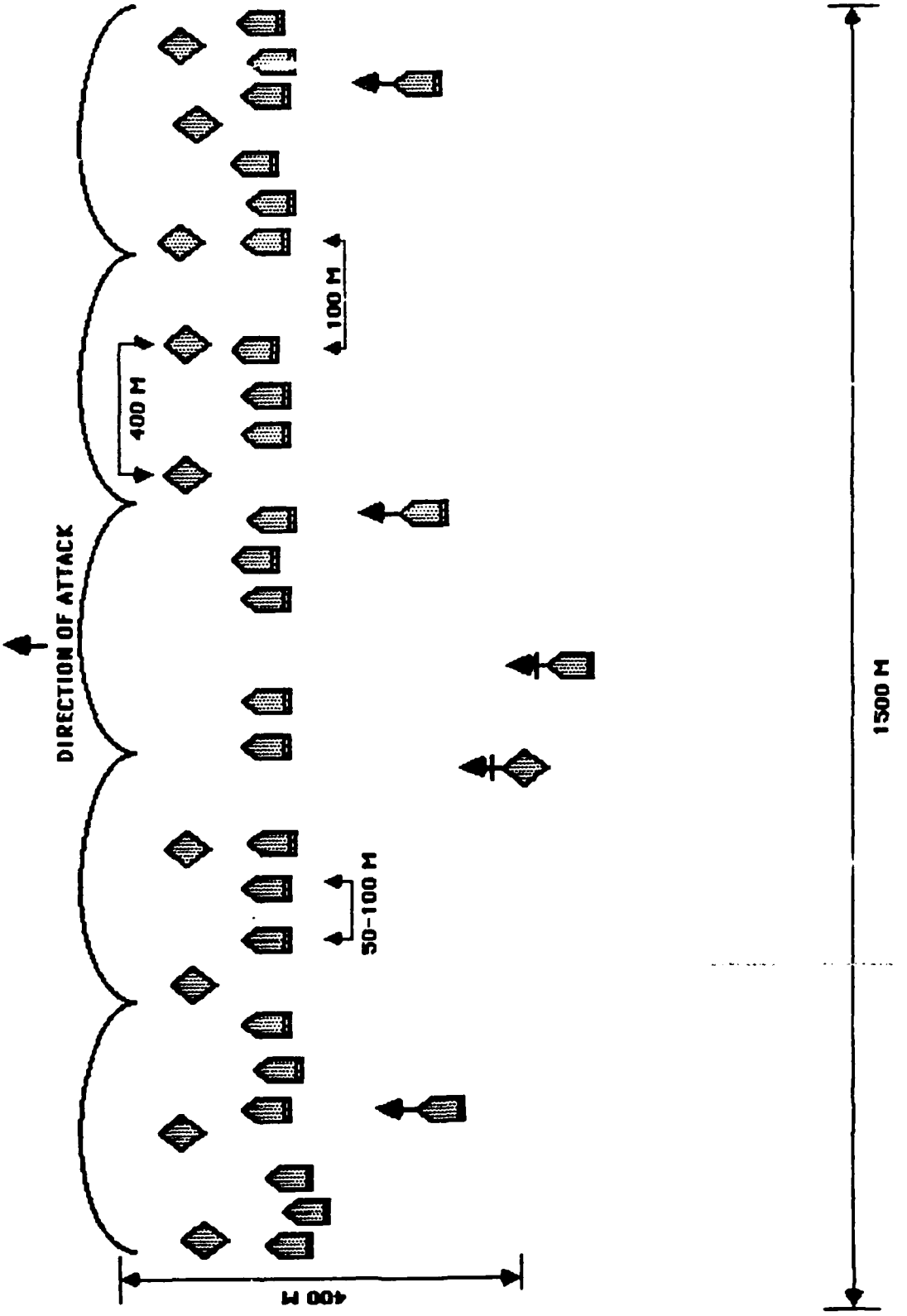

Figure B-5. Red attack vs. Blue defense (1.4.) (Motorized rifle battalion with attached tank company as part of regimental first echelon attack).

Subsequent Scenario Brief 1.5: Red Attack vs. Blue Defense

Threat Unit: Motorized Rifle Battalion with Tank Company Attached

Range Line: Line 2: 1000 meters

Loss Rate: Low - 3 systems (6 systems cumulative)

Threat Composition:

- 9 T-80 tanks
- 21 BMP-2 Armored Infantry combat vehicles with AT-5, 30mm automatic gun, carrying rifle squads of 7 troops and one RPG-14 each
- 4 BMP-2 with AT-5 and 30mm automatic gun, command vehicles

Threat Disposition at 1000 meters (see Figure B-6):

The frontage and depth of the formation is unchanged. Intervals among individual vehicles adjust some to fill gaps in the formation caused by attrition.

The formation occupies a frontage of 1500 meters and a depth of 400 meters.

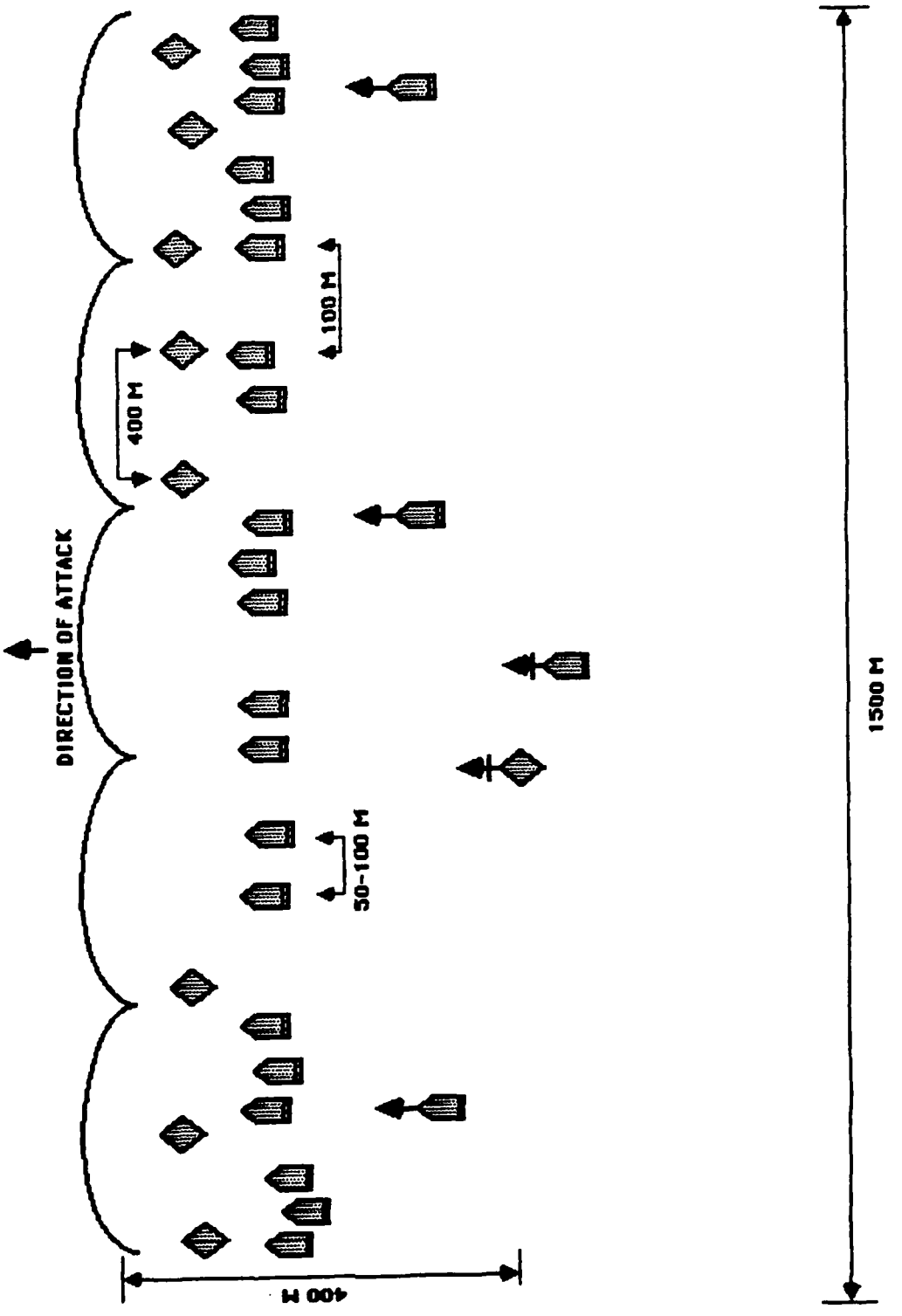

Figure B-6. Red attack vs. Blue defense (1.5.) (Motorized rifle battalion with attached tank company as part of regimental first echelon attack).

Subsequent Scenario Brief 1.6: Red Attack vs. Blue Defense

Threat Unit: Motorized Rifle Battalion with Tank Company Attached

Range Line: Line 1: 400 meters

Loss Rate: Low - 2 systems (8 systems cumulative)

Threat Composition:

- 8 T-80 tanks
- 20 BMP-2 Armored Infantry combat vehicles with AT-5, 30mm automatic gun, carrying rifle squads of 7 troops and one RPG-14 each
- 4 BMP-2 with AT-5 and 30mm automatic gun, command vehicles

Threat Disposition at 400 meters (see Figure B-7):

The speed of the formation has slowed to 6 KPH. Companies remain separated by 50 meters, vehicles within companies have closed to 50 - 100 meters of each other. The infantry platoons are dismounted and following behind the tanks. The BMPs are following the dismounted infantry by 100 meters.

The overall formation width remains intact at 1500 meters.

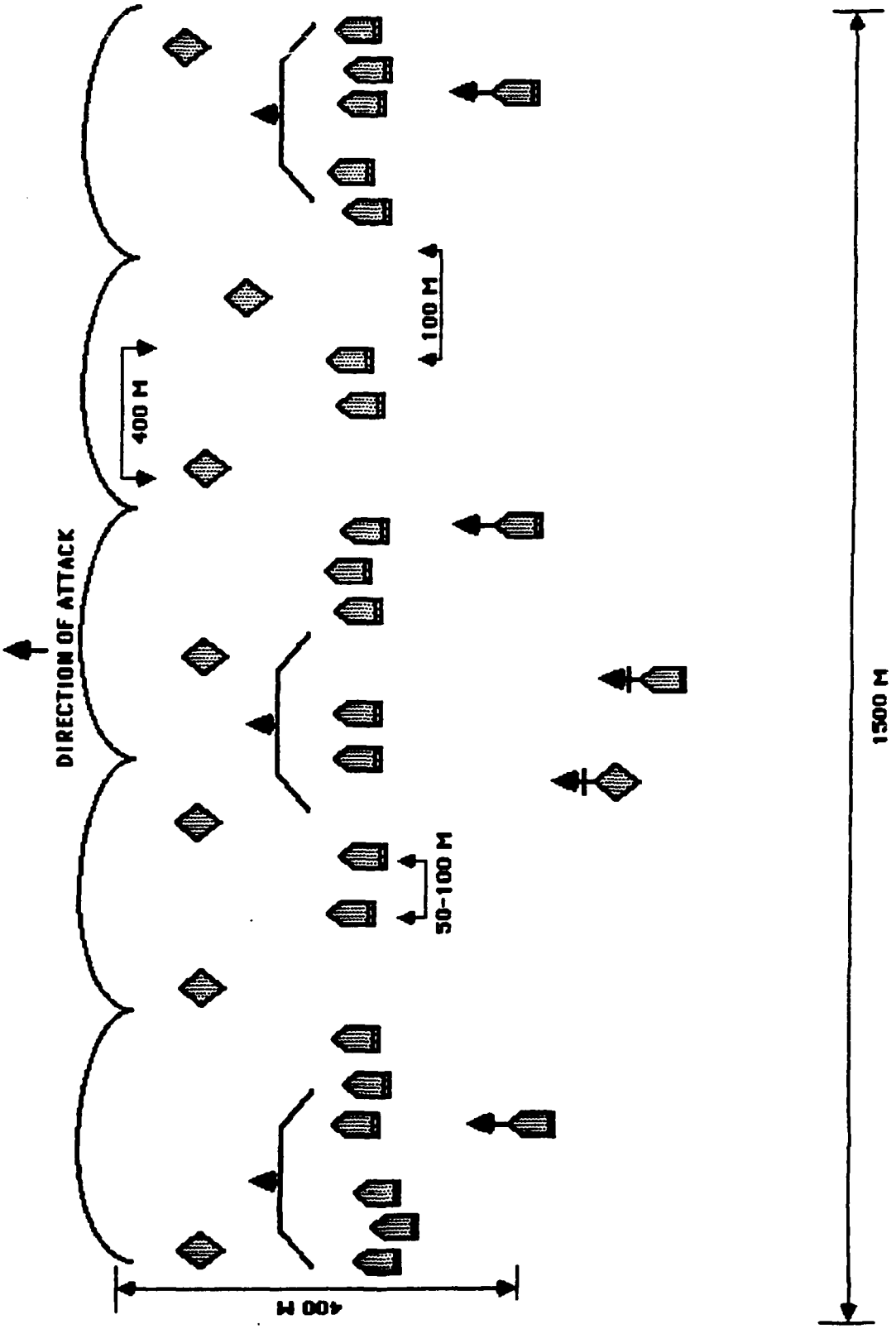

Figure B-7. Red attack vs. Blue defense (1.6.) (Motorized rifle battalion with attached tank company as part of regimental first echelon attack).

F. INDIRECT FIRE: CANNON/MORTAR/ROCKET

Threat Composition: 1 Battery-indirect fire system, consisting of either:
- 6 122mm howitzers
- 8 120mm mortars
- 4 120mm multiple rocket launchers

Threat Disposition: The indirect fire systems fire a 15 minute preparation fire. Coverage extends to 4 herces, or about 4000 square meters. Each 1000 meters square receives approximately 400 rounds of HE munitions. The firing continues until advancing Threat forces maneuver within 1000 meters of the Front-Line-Of-Troops.

Threat Employment: Indirect fire systems are capable of engaging targets within all range bands.